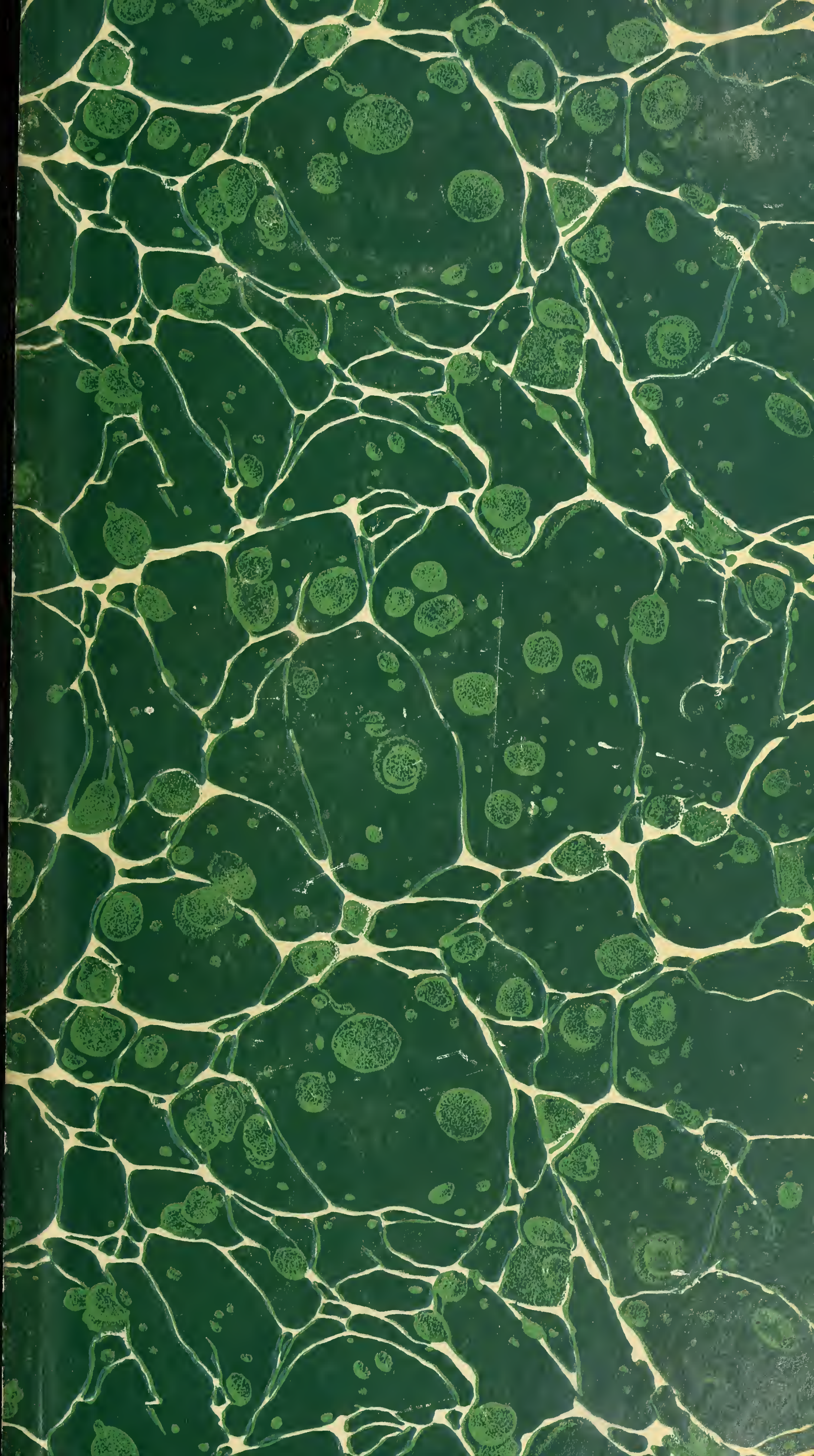

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OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXX 1935

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EDITED BY
J. R. de la TORRE-BUENO

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J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT CARL GEO. SIEPMANN

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NOTES ON THE DIURNAL LEPIDOPTERA OF THE CANADIAN ARCTIC COLLECTED BY OWEN BRYANT IN THE SUMMERS OF 1929 TO 1932.

By R. A. Leussler, Omaha, Nebraska.

With Introduction and Field Notes
By Owen Bryant, Tucson, Arizona.

I.

Introduction.

During the summers of 1929–1932 I collected insects at Fort Churchill, Manitoba, on the west coast of Hudson Bay, now officially known as Churchill, and in the Delta of the Mackenzie River and the adjacent territory, including the coast of the Yukon Territory at Shingle Point, and at Herschel Island, Y. T., and collected also as opportunity offered en route on all four trips.

The 1929 trip was not begun till August 15th, too late to produce any butterflies. In 1930 I spent the month of June at Churchill (the only visit made there) and then went down the Mackenzie, only reaching the Delta by mid July in spite of flying from Edmonton. The intention was to get as quickly as possible from one place to the other in order to be able to compare the faunas in the two places. The latter object was not obtained and is scarcely possible of attainment unless by flying direct from one point to the other without interruption.

If I had not been lucky enough to be invited to make the trip to Herschel Island the day after my arrival I would have seen practically nothing of the butterfly fauna of the Far North that season because in most years it is a thing of the past in the Delta by mid July. At Herschel Island the season lasts a little longer.

In 1932 the intention was to start July first by plane. The first scheduled trip after July 1st was intended to leave July 6th, but did not actually leave till July 9th, and due to unfortunate delays about four days were lost en route bringing the arrival as late as July 14th. No butterflies of consequence were taken except one species of worn "copper," *Lycaena florus,* a group new to the collection.

In 1931 the only full season was put in from March to October, a plane being used in both directions. The trip down was made on skis, the temperature being 52 degrees below zero when we went through Good Hope, and the return trip started only a day or two before ice put an end to flying with pontoons for the season.

I devoted most of my time and attention to collecting Coleoptera and Diptera but nevertheless brought back a considerable number of butterflies and moths.

This being the first paper on the collections, the introduction is intended to serve in part as an introduction to those which may follow as well as to this report on the butterflies.

Wide extensions of the published ranges of some insects are shown by the collection as in the case of *Erebia youngi, Phyciodes campestris, Pyrgus centaureae,* etc. The range of *Brephos infans* has been given as "from Labrador to New York." This moth has long been known to be common in Alberta and occurs near the Husky River in the Mackenzie Delta. This extension of the recorded range is no surprise to the collector. There is no reason why this and a thousand other species of insects not previously known to be there should not be found in the Delta region when it is moderately well collected.

What Taverner terms the "Northern Coniferous Forest," a very expressive term for limiting distribution, extends into the Mackenzie Delta and carries with it a considerable portion of the fauna associated with it in what is known as the Canadian Zone of Alberta and other more southern regions. A few species unknown in more southern regions feed on spruce in the Arctic but the most noticeable change noted in going north is the gradual dropping out of species. A surprising number, however, extend right to the Delta. In fact, the number of forms characteristic of the Canadian Zone which extend with the Northern Coniferous Forest to the Arctic Circle and even to the Mackenzie Delta is the most striking thing about the fauna of Arctic Canada. *Carphoborus andersoni* is the only endemic species I think of which lives on spruce.

The fauna of the arctic tundra is a much more purely arctic one and contains endemic species and some previously known only from the other side of the world.

The Mackenzie Delta. "The Delta" consists of a network of ponds or "lakes" as they are locally called whether they are 100 yards or 20 miles across, and numerous streams, many of them flowing one to two miles an hour or more where a cut-off has recently shortened the distance between two points and thereby increased the grade.

Most of the ponds are filling up and about many are meadows grown up with grass and horse tail, and swampy land grown over with willows. There are considerable raised areas where spruce woods occur with sphagnum under them, and where there is sufficient light, a mat of vines such as *Arctostaphylos* and many roses, *Astragalus,* lupines, fire weed (*Epilobium,* 2 sp.), asters, several species of *Senecio,* etc.

The highest land about Aklavik is about 35 feet above sea level and twenty some above the ordinary level of the river.

On the muddy banks of the river "horse tail" (*Equisetum*) often makes a green covering which at a distance appears to be grass but it yields many less insects than the latter.

The ponds and streams are often surrounded by high banks well grown up with spruce and on the sandier places with Balsam Poplar or Balm of Gilead. The latter grows only thirty or forty feet high so far as observed and about a foot thick.

White spruce is the hardiest tree in the Delta and made the first growth, all the oldest trees being white spruce. Later the black spruce comes in. Spruce grows to within about 15 miles of the end of the Delta along the West Channel and somewhat further near the East Channel. One gathers the impression that if there were any soil dry enough for it to grow on it would grow still further out in the Delta. It does not grow to the ocean on the mainland east of the Delta but stops about fifteen miles short of it except where it is especially well sheltered along the valleys cut by little streams. Along those it grows still further. One white spruce on Catfish Creek near Aklavik had a circumference of six feet eight inches breast high and an age of at least 500 years, since trees 18 to 19 inches in diameter had an age estimated from a count of their rings as over 400 years.

Both spruce and Balm of Gilead reach the same altitude, about 700 ft., near Black Mt., where conditions of soil and shelter are especially favorable. Their extension upward being checked apparently by exposure to northerly storms.

Quite a variety of willows occurs, ranging from some which grow nearly 20 feet high and a foot thick on favorable river banks to the small prostrate *Salix reticulata* on the mountains, and a still smaller willow, *Salix uva-ursi,* which makes a woolly mat of tiny rounded leaves over a tangle of prostrate stems, the whole seeming to be not more than an inch in height. The principal species of the river and lake banks have narrow leaves or large leaves dark green above and whitish and woolly beneath.

Alder forms thickets and leafy bowers in the lowland and almost impenetrable patches of brush three to four feet high on the slopes of the mountains. One alder was noticed forming a fine straight symmetrical tree over twenty feet high and about ten inches thick.

A paper birch, a variety of *Betula papyrifera,* grows opposite to Aklavik and at many places west of it especially about certain "lakes." The largest observed were about 8 to 10 inches in diameter. *Betula glandulosa,* a black birch, forms a scrubby growth in the lowlands and ascends the mountains, gradually taking on the form of a "ground birch" which lies prostrate along with the willows.

The Delta is about fifty miles wide and is bordered by high land on each side which represents the petering out of the Mackenzie Mountains on the east and of the Richardson Mountains on the west, both being part of the northern extension of the Rockies. The land therefore rises quite abruptly on either side.

Black Mountain, 3,300 feet, and Red Mountain west of the Delta are formed by the disturbances which raised the Richardson Mountains, as are the hills northwest of Aklavik which gradually dwindle to 500 feet and then merge into land sloping to the ocean. They may therefore be said to represent the gradual dwindling of the Richardson Mountains. On the east of the Delta the hills rise to only about 500 feet.

Black Mountain and Red Mountain are connected by what appears to be a ridge from a thousand to tweny-six hundred feet in height and about twelve miles long. The apparent ridge is extended westward to form a plateau which is dissected by streams almost down to sea level and has occasional elevations of sixteen hundred feet or so, though most of it is undulating tundra about a thousand feet high, with a few ponds. The east slope of the connecting ridge is an escarpment formed by an overturned fold and thrust fault exposing about two thousand feet of dark shale, probably about the age of the Benton. The higher elevations in the Black Mountain region are mostly capped by massive sandstone which weathers into thick slabs, some of huge size. Many boulders and smaller rounded stones of quartzite occur on the higher ridges apparently left on top of the sandstone by glaciers.

The temperature of the river water in the Delta reaches 60 degrees in summer though it is only a few inches down to frost in muskegs not far from the river in midsummer. This high water temperature has considerable effect on the distribution of animal and vegetable life near the river as it must withdraw the frost more early and more completely besides tending to keep the air a more even temperature.

The sun remains up for nearly two months in summer, which causes a very rapid development of plants and possibly of animals permitting butterflies to be on the wing till 11 P. M. and bees to work till late hours of the night, and below the horizon for about the same length of time in winter.

Occasional snow storms may occur during summer, sometimes making huge drifts and cornices at elevations of a thousand to fifteen hundred feet. Severe blows come from the West or more often the North. The latter often last for days bringing very cold weather.

Collections were made at the following localities:

Churchill, Manitoba. On the west shore of Hudson Bay, 58 degrees north Latitude. The region immediately along the shore is very cold, much colder than the Mackenzie Delta. In fact, the whole slope toward Hudson Bay is much colder than the Mackenzie Basin. The ice is said to get 28 feet thick in Churchill Harbour, and Tyrell was nearly stopped by ice on Dubawnt Lake in August. In the pools among the rocks on the point ice lasted late into June and some willows were only blossoming then. At times throughout June I would get so cold working in a tent without a stove but well smothered in clothes that my hands and legs to the knees got numb and I retired to bed for two and three days on end.

The shore at Churchill is treeless though some stumps were observed. For a few miles back there is a wet tundra with occasional stunted trees with wedge shaped trunks a foot or more thick at the base and only ten feet or so tall. A few miles back a more normal growth of trees occurs. There are extensive developments of salt marshes and swamps. Chrysanthemums grow in the marshes, at high tide forming lumps in the marsh which are actually in the water during high tides.

Most of the *Oeneis, Erebias,* etc., occurred on the wet tundra back from the shore. I never collected far enough back from the shore to more than reach the edge of the wooded region because I considered the latter less interesting. Few butterflies, except *Pieris napi* reached our camp on the Point, and those were only seen occasionally throughout June.

Herschel Island, Yukon Territory. In Beaufort Sea, Latitude 70 degrees north, Longitude 139 degrees west, and only a few miles from the international boundary. Few people would realize that it is actually so far west that its correct time is one hour later than that at Vancouver. There is a sand spit on the south east forming a rather open roadstead and it is separated from the mainland by only a mile of very shallow water. The main part of the island rises to a height of 500 feet and is covered with tundra and a rank growth of herbaceous plants forming banks of flowers, heather, lupine, *Artemisia, Pedicularia,* etc. A stream runs down from a pond and ends in a sloping bog at the head of the harbor. In late July part of the stream still flowed under a cover of ice and there were huge masses of packed snow in some of the protected hollows which had apparently lain on the vegetation so long as to kill it. Where the snow had retreated it left large patches quite brown and dead looking. *Erebia fasciata* and *herscheli* and the dwarfed form of *Colias nastes* race *rossii* occurred in the higher grassy portion of the island. *Brenthis* was commonest at the base of the upland.

During all of the two weeks I was on the island nothing was to be seen from the higher parts except floe ice as far as the eye could see in three directions—not a drop of open water. Only in a direction towards the mainland could open water be seen and that was more or less dotted with loose ice and quite sizable blocks perhaps twenty feet high washed up on the beach on the outside of the spit. The quantity of ice and adjacent open water about the Island has a marked effect on its climate, making it cold and very foggy; only an hour or two of good weather occurred at intervals during two weeks. In fact the police resident there state that their "summer" comes in June before open water causes fog to form.

Herschel lies right off the end of the Rocky Mountains and some characteristic Alpine plants of the Rockies reach it as well as a West Alaskan (and Siberian?) flora, as was first pointed out to me by Robert Porsild, a Danish botanist who grew up in Greenland.

Shingle Point, Yukon Territory. Shingle Point is a long low sand spit partly composed of shingle and covered with driftwood, projecting eastward from the tundra which along that shore is undulating and reaches elevations of about one hundred feet.

Fort McPherson, North West Territory, is on the Peel River 12 miles above the head of the Husky River. Some hills thereabouts reach a few hundred feet in height.

25 miles east of Aklavik is one of the highest pieces of ground in the Delta, with ponds, etc.

Aklavik, North West Territory. On the West or Peel Channel of the Mackenzie Delta, twelve miles below its junction with the Husky River. Its latitude is 68 degrees north and its longitude 135 degrees west. It is actually on an island formed by some of the many interconnecting streams, though it is on the bank of the main West Channel.

Collections were made in the immediate vicinity of the town of Aklavik.

Base Camp. Located on the Husky River, the most westerly stream of the Mackenzie Delta, which takes part of the water of the Peel to empty it into the West Channel of the Mackenzie Delta, twelve miles above Aklavik. It is 25 miles southwest of Aklavik, east of the ridge between Black Mountain and Red Mountain. Collections were made mostly west or south of the camp and between the camp and Black Mountain. Some collecting was also done a little bit north of the camp, but never very near Red Mountain or on Red Mountain itself.

Black Mountain. Thirty miles southwest of Aklavik and immediately west of the Mackenzie Delta. Its summit is 3,300 feet by pocket aneroid. Black Mountain labels were used on all specimens collected on the ridge connecting it with Red Mountain or any elevated ground west of the Husky as well as on those collected on Black Mountain proper. Butterflies were collected principally at about 500 feet and 2,000 feet on Black Mountain proper. Some collecting was done at all altitudes except the highest part of Black Mountain, the weather being very bad when it was visited.

Base of Black Mountain was used on labels to designate the area immediately adjacent to the escarpment because it is permanent "dry" land, not a part of the Delta or subject to flooding; it is an area of tundra and spruce woods with considerable willow and alder growth in the lower portions, and areas grown up mostly to caribou moss and herbaceous plants where fire has destroyed a previous growth of small spruces. Due to its freedom from floods it seems to have acquired a somewhat different fauna from even the most elevated portions of the edge of the Delta. A dark form of *Oeneis jutta, Coenonympha yukonensis* and a copper were taken there. Larvae, presumably of *Papilio aliaska,* though they were not reared to adults, were also found there. The latter probably feed in the Delta as well, for their food plant occurs there, and a blacker specimen of a larva was found though no adults were taken in the Delta proper.

50 miles northeast of Aklavik. Plebejus scudderi and a number of other insects taken only, or first, at that locality were taken 50 miles northeast of Aklavik just east of the Delta at the foot of a range of hills which border the Delta in that region. It is a very warm region in summer for the rather sandy hills slope west catching the rays of the sun all night long and the winds are mainly tempered by the warm water of the Delta over which they flow. For this and other localities east of the Delta Tununuk labels were used. The various localities being distinguished by lot numbers.

The practice in labelling the specimens of all orders of insects has been to use Aklavik labels for Aklavik, Base Camp, Black Mountain and Base of Black Mountain as well as at least one locality in the Delta east of Aklavik, the separate localities and altitudes being distinguished only by lot numbers. For all localities outside the Delta the nearest Hudson Bay Company's Post was used. That practice was adopted because the average entomologist might be able to locate the various Hudson Bay Company's Posts on a map but would be unable to find the localities which it seemed worth while to distinguish as above. In the text the more exact localities are given through the use of the lot numbers. The four regions grouped under Aklavik labels have more or less distinct ecological factors and have each developed a more or less characteristic fauna though not enough collecting has been done yet to make it possible to say that species do not occur in any one. However, up to date certain species have been found in only one of the above four subregions. For instance, *Brenthis distincta* and *Plebejus aquilo bryanti,* have been taken only in the subregion referred to as Black Mountain and are not expected to occur in the Delta proper. *Brenthis pales alaskensis* is another species which has been taken only in the Black Mountain subregion. *Erebia fasciata* and *Erebia youngi* have been taken only in this subregion and at Herschel Island, those localities having certain ecological similarities. One butterfly, *Brenthis gibsoni,* has been taken only in the Aklavik subregion.

Phyciodes campestris and *Pyrgus centaureae* have been taken only in the Base Camp subregion. These two regions are not very sharply differentiated from each other and therefore it is not surprising that *Lycaenopsis marginata* and some others have been found only in these two subregions.

Oeneis jutta, Coenonympha yukonensis and the copper *helloides* have been taken only in the base of Black Mountain subregion.

Plebejus scudderii has been taken only in the warm region E. of the Delta. Certain plants occur only on that side of the Delta also, according to Robert Porsild, who states that it is a distinct floral region. It is probably a distinct faunal one also. *Artemisia frigida* or some species like the common white *Artemisia* of the Alberta prairie which makes old plowed areas on the prairie conspicuously white was the only distinctive plant noticed by the writer.

The most surprising and interesting thing about the Mackenzie Delta to a collector is the very large number of southern species which occur there. The extension of many common Canadian Zone insects to the Arctic Coast is far more interesting than the few undescribed species which occur there or than even the much more interesting circumpolar fauna.

The collection as a whole contains in the neighborhood of one thousand species of insects and many spiders and Chilopoda, counting only those species found north of the Arctic Circle. Beetles make up about one-third, flies about another third, and other orders account for the rest, with something like one hundred Lepidoptera, probably fifty or more Hemiptera, two Orthoptera, several each of Odonata, Neuroptera, Ephemeroptera, Trichoptera, Plecoptera, Collembola, Psocids, and a large number of Hymenoptera, including Chrysididae, Stelis, Megachile, Halictus, etc.

Only 161 named species of insects and 9 Arachnida were taken in Arctic Canada by the Canadian Arctic Expedition—about one-half the number of species which could have been taken in either of two orders (Coleoptera or Diptera). The number of beetles taken by the Canadian Arctic Expedition is less than are known to occur in each of two of the forty families which occur there and probably in at least four of them. There are about twice as many Carabidae alone as the total named beetles taken by the Canadian Arctic Expedition in Arctic Canada, certainly a good many more Dytiscidae and probably Staphylinidae and Curculionidae. Instead of ten families of beetles taken by the Canadian Arctic Expedition more than 40 occur.

Nineteen species of butterflies were taken in Arctic Canada by the Canadian Arctic Expedition, several of which were not recognized among the present collection of Arctic species. It is possible that they occur only east of the Mackenzie Delta.

Thirty-five forms of butterflies were taken in the Mackenzie Delta by the author of this introduction, and three additional forms on Herschel Id., making a total of 38 forms taken north of the Arctic Circle. Nine more forms are recorded from Arctic Canada in the report of the Canadian Arctic Exp., making a total of 47 forms recorded from north of the Circle in the North West Territories. Some species have been recorded recently from Baffin Land and vicinity but the records have not been checked with these.

Of 8 forms taken at Herschel Id., during a two weeks' stay, three were not taken along the Mackenzie or in the Delta, whereas of ten forms taken at Churchill only 4 were also taken on Herschel Id., along the Mackenzie or in the Delta. The butterfly fauna of Churchill therefore is more distinct from that of the Mackenzie region as a whole than those of Herschel Id. and the Mackenzie are from each other.

I have no doubt that about 1500 species of insects occur in Canada north of the Arctic Circle. My collection adds *Chilopoda,* four orders, about 90 families and 800 species of insects to the previously recorded fauna of Western Canada north of the Circle, but is an unfinished collection containing not even the species I could have collected there if I had not been forced to quit. Other collectors could add largely to it.

The report of the Canadian Arctic Expedition contains most of the previous records from north of the Circle in Canada. The report on butterflies is the most complete and satisfactory of the reports on the higher insects as far as my experience enables me to judge. The fly report contains 14 families and 48 species whereas my collection contains in the neighborhood of 40 families and 300 species. Johansen can be forgiven for overlooking a few species of insects since he was expected to collect all the mammals, birds, fishes, reptiles, amphibians, all classes of terrestrial and marine invertebrates and plants, besides being handicapped as a member of an expedition and therefore unable to dispose of his time as he chose or go where he could get the most material.

The Harriman Alaska Expedition got about the same number of species as I found in the Delta, in a very circumscribed area, but distributed in different proportions in the families and orders.

(*Continued in April Bulletin.*)

New Record for New Jersey. Lepidoptera Noctuidae.—*Anomis flava fimbriago* Steph. 3♂, 2♀, Lakehurst, N. J., Oct.-Nov.

Mr. Benjamin writes about them, "The insect is not as abundant as *erosa* and your specimens are our northernmost record.

This species is sexually dimorphic, in *erosa* the sexes are alike; the ♂ antennae are strongly serrate, as against very weakly serrate in *erosa*; the t. p. line is bent inward below the reniform, strongly excurved in the submedian area, which results in the formation of a defined area which is practically an open subreniform, the t. p. line in *erosa* is nearly erect from the base of the reniform to vein I, hence no area like an open subreniform is defined."—FREDERICK LEMMER, Irvington, N. J.

MODIFICATIONS IN THE GENITALIA OF THE MALE MEGARHYSSA LUNATOR.

By Cyril E. Abbott, Morgan Park, Ill.

The abdomen of the male *Megarhyssa lunator* appears to consist of nine segments, although only seven of these are prominent, the two terminal sections telescoping into the seventh segment. The anus opens dorsally through the eighth segment; it is a slightly extroverted tube on either side of which is a very much reduced cercus.

The internal genitalia exhibit few peculiar modifications. Into the proximal part of the penis opens a short, comparatively broad *ejaculatory duct* (Fig. 1, P & ED). Near the penis this duct is expanded to form a bulbous portion to which are attached the muscles subsequently described. A short distance anteriorly the duct bifurcates, forming the paired *vasa defferentia* (VD). These tubes, in passing forward, encircle the digestive tract, and terminate in the closely adherent, yellow, elongated *testes* (T) which lie upon the gut. About midway between the ejaculatory duct and the testes each *vas defferens* is expanded to form a lateral pouch or *seminal vesicle* (S).

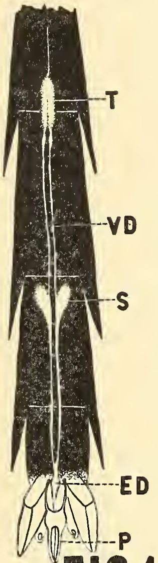

FIG. 1

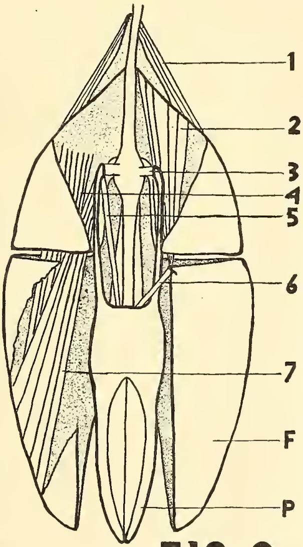

FIG. 2

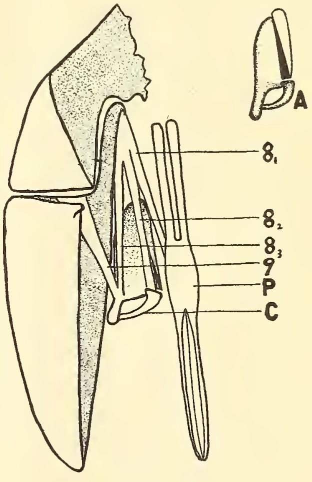

FIG. 3

The external genitalia consist of the *penis* (P in all figures), the *genital flaps* (Fig. 2, F), and the *claspers* (Fig. 3, A & C). Because of its peculiar form, as well as its relationship to these parts, I have included the segment to which they are attached. It is easily recognized in Figs. 2 & 3. It is nearly triangular, with the apex anterior and ventral, while the basal angles meet dorsally. The posterior ventral margin is bisulcate. Into each of the sulcations fits the extended and apically recurved ventromedian angle of a genital flap. Otherwise this flap is quite regular, spoon-shaped, with the concavity directed inward. The dorsomedian angle of the flap is in contact with that of the other flap and with the corresponding dorsomedian angle of the last abdominal segment. To the ventromedian margin of each flap is attached a genital clasper. This clasper is posteriorly bifurcate: the outer extension straight, blunt, heavily sclerotized, and firmly attached to the body of the clasper. The inner extension is hinged at its point of attachment; heavy, taper-pointed, and so curved that its free end is hidden beneath the outer extension. The inner margin of each clasper "turns up," that is, it is directed dorsally. The claspers are shown, though not in detail, in the illustrations for Riley's article in *Insect Life* (1888).

The penis is elongated, flattened, heavier at the margins; the exposed portion is slit to the anterior margin (Fig. 2). Anteriorly it is prolonged into the body cavity as two lateral extensions.

The free end of each of these extensions of the penis is attached, by a short muscle, to the walls of the ejaculatory duct; this muscle, by contraction, doubtless serves to expand the duct (Fig. 2, 3). The opposite condition (relaxation of the duct) is brought about by a pair of muscles, each of which joins the free end of each extension with the anterior margin of the mid-part of the penis (Fig. 2, 5). Another muscle (6) connects the dorsomedian angle of each flap with the mid-part of the penis, which it doubtless tends to retract. To this same part of the flap is attached the narrow end of a sheet of muscle (2) spreading fanwise to connect with the anterior margin of the abdominal segment. It tends to draw the flap inward. Another fan-shaped muscle connects the end of each extension of the penis with the wall of the corresponding flap (7). It serves the double function of flexing the flap and extruding the penis. A band of muscle (4) connects the inner wall of the segment with that of the corresponding flap. Curiously enough, no muscles were found which might account for the spreading of the flaps, though such muscles must be present. The muscle marked 1 in Fig. 2 connects the segment with a ventral plate of which only the anterior is figured.

A muscle, the broad end of which is fastened to the anterior and ventral margin of the flap (Fig. 3, 9) connects with the interior wall of the clasper at the base of its outer bifurcation. The recurved ventroanterior extension of the flap gives rise to a band of muscle various portions of which are inserted on the ventral side of the penis (8_1) and the interior of the clasper near the bases of the bifurcations (8_2, 8_3).

These modifications have to do with the mating activities of *Megarhyssa,* particularly the peculiar position assumed by the male during copulation, making it necessary for the penis to be inserted in a reversed and inverted position.

NOTES ON THE OVIPOSITION AND HATCHING OF CORYTHUCHA MARMORATA UHLER.

By Cyril E. Abbott, Morgan Park, Ill.

During the past summer *Corythucha marmorata* Uhler appeared in this region in unusually large numbers. The first eggs found were on the under side of an oak leaf, where they were placed at regular intervals in a fully exposed and erect position with each pedicel inserted in the leaf. Later eggs were found on giant ragweed (*Ambrosia trifida* L.) and other similar plants, but there, due doubtless to the softness of the tissues, the eggs were *embedded* in the leaves. Such eggs were deposited irregularly and at various angles; in some cases the long axis of the egg was even bent, but the capped end of every egg was exposed.

The eggs are very small (0.3 by 0.7 mm.), jet black, and covered at one end with a "cap" like that of a poppy seed-capsule.

When the young bug emerges the cap is first displaced. Sometimes it clings to the insect; more often to the otherwise intact eggshell. Newly emerged Hemiptera are all much alike, and to this the young *Corythucha* is no exception. The head is very large, the body bowed, colorless and nearly transparent. In about an hour after hatching the body becomes dirty brown in color. The young bug is covered with an array of hairs which at this stage are single, but which become more complex with every ecdysis, until the nearly adult bug resembles the moving forest described in "Macbeth."

Where the tender mouth-parts of the young bugs find sufficiently tender plant tissues for feeding I have not discovered; all attempts to bring the insects to maturity in captivity failed. Mr. Wm. Gerhard, of the Field Museum, kindly identified the specimens.

HIBERNATION OF URANOTAENIA SAPPHIRINA (OSTEN SACKEN) (DIPTERA: CULICIDAE).

By W. Keys Lawlor, New York State Museum.

Uranotaenia sapphirina (O. S.), the sapphire-lined mosquito, is rarely taken, despite its wide distribution throughout the Antilles, Central America and North America. The females are not troublesome, but according to Dyar (1928) will bite under favorable conditions. The habits of the males are unknown. Larvae prefer pools of a permanent or semi-permanent nature, containing *Spirogyra* or *Lemna,* such as are inhabited by *Anopheles* larvae, which the larvae of *U. sapphirina* closely resemble at first glance. Breeding seems to be continuous throughout the summer.

In 1904 Professor John B. Smith suggested that *U. sapphirina* hibernates in the adult stage, since the partially submerged egg rafts are not well adapted to overwintering, since the larvae had never been collected during the winter months and since the larval habit of resting and feeding just under the surface would not be suited to hibernation in that stage. There appears, however, to be no published confirmation of this suggestion.

On February 3, 1934, while making observations on the hibernation of mosquito species in connection with the Federal Civil Works Pest Mosquito Control Work Relief Program, carried on by the U. S. Bureau of Entomology in collaboration with the New York State Museum, the writer, accompanied by R. S. Coburn and Paul E. Hering, collected an adult female, *U. sapphirina,* hibernating on the ceiling of a small cave near South Bethlehem, Albany County, New York. Subsequently on February 24, 1934, another adult female was captured in the same cave. Two more females were taken on March 3, 1934.

On the same dates, *Culex pipiens* Linn. and *Anopheles punctipennis* (Say), the only other mosquitoes hibernating in the cave, were collected in abundance.

Dyar, H. G. 1901. The Life History of *Uranotaenia sapphirina.* O. S. Journ. N. Y. Ent. Soc. 9: 179–182.

Dyar, H. G. 1928. The Mosquitoes of the Americas. Carnegie Institution of Washington, Pub. No. 387: 421.

Smith, John B. 1904. New Jersey Agr. Exp. Sta. Rept. on Mosquitoes, p. 338.

FIVE NEW SPECIES OF MIRIDAE (HEMIPTERA).[1]

By H. G. Johnston, College Station, Texas.

Orthotylus robiniae n. sp.

Allied to *ramus* Knight but differs in the shorter rostrum, and in the structure of the male genital claspers.

Male. Length 3.6 mm., width 1.3 mm. Head: width .71 mm., vertex .37 mm. Antennae: segment I, length .26 mm.; II, 1.0 mm.; III, .63 mm.; IV, .37 mm.; yellowish green, segments III and IV dusky. Rostrum, length .86 mm., slightly surpassing hind margin of mesosternum; yellowish green, apex black. Pronotum: length .54 mm., width at base 1.09 mm.

Uniformly green or yellowish green, membrane uniformly pale fuscous. Clothed with simple, pale yellowish pubescence. Genital characters distinctive, left clasper with dorsal and ventral arms nearly extending in same plane, dorsal arm curving inward along margin of genital segment to near the dorsal surface, gradually flattened forming a thin spatulate apex furnished with several short, blunt teeth, ventral arm acuminate, following margin of genital segment to beyond middle then curving inward and upward forming an elongate "S"; right clasper inwardly curved, with blade-shaped arm at base curving upward and inward, forked near apex forming two short, flattened, acuminate arms curving inward and upward to near middle of genital segment their apices flattened and with short, blunt teeth; dorsal margin of genital segment with slender chitinous spine projecting posteriorly.

Female. Length 3.5 mm., width 1.4 mm. Head: width .71 mm., vertex .37 mm. Antennae: segment I, length .25 mm.; II, .92 mm.; III, .63 mm.; IV, .42 mm. Pronotum: length .54 mm., width at base 1.09 mm. Very similar to male in size, form, pubescence and coloration.

Holotype: male May 15, 1931, Natchez, Mississippi (H. G. Johnston); author's collection.

Allotype: taken with the type.

Paratypes: 16 males and females taken with the types on locust (*Robinia pseudo-acacia*), which is no doubt the host plant.

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[1] Contribution from Entomology Department, Texas A. & M. College, College Station, Texas.

Plagiognathus reinhardi n. sp.

Related to *delicatus* Uhler but distinguished by longer second antennal segment and bright red color.

Male. Length 3.1 mm., width 1.1 mm. Head: width .65 mm., vertex .29 mm.; pale reddish brown, tylus fuscous. Rostrum, length .92 mm., reaching apex of intermediate coxae. Antennae: segment I, length .21 mm., dark brown to black, pale at apex; II, .96 mm., yellowish brown, blackish at base; III, .63 mm.; IV, .29 mm. Pronotum: length .50 mm., width at base .96 mm.

Coloration bright red to dark red; head, except tylus, and anterior portion of pronotum paler, cuneus at base and narrowly on outer margin pale translucent, membrane black, tinged with red, veins red. Venter, sterna, and pleura reddish brown to fuscous. Legs pale; femora with three rows of brown spots on lateral aspect; tibial spines black with black spot at base of each, but becoming obsolete apically; apex of tarsi black. Clothed with simple, golden yellow pubescence.

Female. Length 3.4 mm., width 1.2 mm. Head: width .67 mm., vertex .33 mm. Antennae: segment I, length .21 mm., black, pale at apex; II, .92 mm., yellowish, black at base; III, .58 mm.; IV, .25 mm. Pronotum: length .58 mm., width at base 1.1 mm. Coloration and pubescence very similar to the male.

Holotype: male, April 3, 1933, College Station, Texas (H. G. Johnston); author's collection.

Allotype: taken with the type.

Paratypes: 63 males and females taken with the types on *Crataegus* sp., where the species was breeding. 13 males and females April 1, 1 female March 29, 1 male April 3, 1 female April 21, 1933, College Station, Texas (H. J. Reinhard).

The writer is pleased to name this beautiful little species for Mr. H. J. Reinhard, who is well known for his work on Tachinidae, and who was the first to locate this species.

Sthenarus viticola n. sp.

Distinguished by small size, pale yellowish to brownish color, and an abundance of coarse yellowish to golden, simple pubescence.

Male. Length 2.5 mm.,width 1.1 mm. Head: width .56 mm., vertex .29 mm. Antennae: segment I, length .14 mm.; II, .73 mm.; about equal in thickness to segment I although more slender near base; III, .33 mm.; IV, .25 mm.; uniformly pale yellowish brown; clothed with fine yellowish pubescence. Rostrum: length .71 mm., reaching posterior margin of interdiate coxae, yellow, apex brown. Pronotum: length .42 mm., width at base .96 mm.

Clothed with simple, coarse, yellowish to golden pubescence; uniformly pale yellowish to brownish above and below; membrane dusky, veins sometimes paler.

Female. Length 2.6 mm., width 1.1 mm. Head: width .56 mm., vertex .32 mm. Antennae: segment I, length .13 mm.; II, .58 mm., scarcely equal in thickness to segment I, much thinner on basal half; III, .31 mm.; IV, .25 mm. Pronotum: length .42 mm., width at base .92 mm. Coloration usually a paler yellowish brown than the male, pubescence very similar.

Holotype: male, May 25, 1931, Corinth, Miss. (H. G. Johnston); author's collection.

Allotype: taken with the type.

Paratypes: 10 males and females taken with the types on wild grape (*Vitis* sp.). 6 males and females May 15, 1931, Natchez, Miss. (H. G. Johnston), also on wild grape.

Neoborus osmanthicola n. sp.

The coloration suggestive of *canadensis* V. D., but differs in the broadly pale margins of scutellum, nearly glabrous surface of the dorsum, the less prominent eyes and shorter rostrum.

Male. Length 4.6 mm., width 1.9 mm. Head: width 1.01 mm., vertex .42 mm.; vertex and frons sharply declivent; yellowish, tylus brownish black with few scattered, yellowish hairs. Rostrum, length 1.09 mm., scarcely attaining the posterior margin of mesosternum, yellowish, apex black. Antennae: segment I, length .54 mm., brownish black, nearly glabrous; II, 1.36 mm., yellowish brown becoming brownish black basally; III, .52 mm., fuscous; IV, .33 mm., fuscous. Pronotum: length .88 mm., width at base 1.56 mm., lateral margins straight, but scarcely carinate.

Dorsum nearly glabrous, shining, a few rather conspicuous hairs on embolium, outer margin of corium and cuneus; short, inconspicuous hairs in punctures on clavus, inner apical margin of corium, and hind margin of pronotum. Coloration yellowish brown and marked with reddish brown; clavus reddish brown, paler along apex of claval vein; corium on apical one-third reddish brown, anal ridge and extending along inner apical angle fuscous to black; apex of embolium pale yellowish; cuneus yellowish, apical one-half dark red. Scutellum yellowish brown, side margins yellow, impunctate. Membrane uniformly dark brown, veins paler at apex of areoles. Venter and sternum dark brown to black. Legs yellow, apex of hind femora, tibiae, and apex of tarsi brown.

Female. Length 4.8 mm., width 2.2 mm. Head: width 1.06 mm., vertex .50 mm. Antennae: segment I, length .51 mm.; II, 1.17 mm.; III, .53 mm.; IV, .37 mm.; brown to fuscous. Pronotum: length .96 mm., width at base 1.78 mm. Slightly more robust than the male but very similar in coloration, pubescence, and puncturation.

Holotype: male April 18, 1931, Lyman, Miss. (H. G. Johnston); author's collection.

Allotype: taken with the type.

Paratypes: 11 males and females taken with the types on wild olive (*Osmanthus americanus*), where the species was evidently breeding.

Phytocoris tillandsiae n. sp.

This species belongs in group III of Dr. Knight's key (Hem. Conn., 1923, p. 641) but differs from other species in that group by the pale bluish-green color on pronotum and hemelytra.

Male. Length 5.0 mm., width 1.6 mm. Head: width .96 mm., vertex .21 mm.; uniformly pale yellowish green. Rostrum length 2.0 mm. reaching upon middle of venter, fuscous, first segment pale green. Antennae: segment I, length .88 mm., pale greenish yellow, indistinctly marked with irregular fuscous spots; II, 2.3 mm., yellowish to fuscous; III, 1.1 mm.; IV, .75 mm.; III and IV fuscous. Pronotum: length .75 mm., width at base 1.3 mm., pale bluish-green, darker on posterior half, paler on disk behind calli, calli and collar yellowish to fuscous, several elongate fuscous spots near posterior margin. Scutellum pale green, a vague fuscous spot each side of median line on apical half. Hemelytra bluish-green clouded with fuscous; embolium pale green with numerous irregular fuscous spots; inner margin of clavus and along commissure pale; cuneus pale green, large black spot on apical third and extending along inner margin to basal third, apex white, small black spot on inner basal angle with tuft of fuscous simple hairs; membrane and veins fuscous, veins white around apex of areoles. Simple pubescence pale on head and anterior portion of pronotum, brown on posterior half of pronotum with brown spot at base of each hair, pale yellowish to brown on scutellum and hemelytra; intermixed on dorsum with tufts of white sericeous pubescence. Sternum and venter pale green to fuscous. Coxae pale green; femora fuscous, pale at base, closely spotted with small and coalescing pale green spots, posterior aspect of hind femora largely pale green; tibiae pale green, spines brown, apex of front and middle tibiae and tarsi fuscous; hind tibiae pale only on basal third, apical two-thirds fuscous with large pale green marks. Genital claspers similar to *pinicola* Knight but distinctive. Left clasper broader at base, longer and more slender on apical two-thirds and more abruptly curved; right clasper more slender, acuminate and broadly curved to form a distinct hook on apical third.

Female. Length 4.6 mm., width 1.7 mm. Head: width .88 mm., vertex .33 mm. Antennae: segment I, length .96 mm.; II, 2.14 mm.; III, 1.05 mm.; IV, .79 mm. Pronotum: length .79 mm., width at base 1.3 mm. Very similar to male in pubescence and coloration.

Holotype: male, April 18, 1934, Huntsville, Texas (H. G. Johnston); author's collection.

Allotype: taken with the type.

Paratypes: 7 males and females taken with the types on Spanish moss, *Tillandsia usnecoides,* where the species breeds. Female, May 10, 1928, male, March 27, 1930, male, April 21, 1934, College Station, Texas, on Spanish moss (H. G. Johnston); 7 males and females, April 16, 1931, Biloxi, Mississippi; male, May 12, 1931, Columbia, Mississippi, reared from nymphs collected on Spanish moss (H. G. Johnston).

The adults of this species evidently leave Spanish moss soon after reaching maturity, since practically all the specimens taken have been teneral, and adults are scarce even when nymphs are abundant. The bluish green color is indistinct until the specimen has reached maturity.

(Myllocerus) Corigetus? castaneus Roelofs.—Specimens of this weevil, hitherto unreported from the United States, were taken at Montclair, N. J., in July, 1933, probably from oaks, by Mr. Alan S. Nicolay. Mr. L. L. Buchanan, of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, to whom a specimen was submitted for identification, states that it evidently does not belong in the genus *Myllocerus,* and refers it tentatively to *Corigetus.*

The beetle was first described by Roelofs in 1873 in Annales de la Société Entomologique de Belgique, volume 16, pages 168–169, as from Japan. No mention was there made of habits. E. Reitter, in Deutsche Entomologische Zeitschrift, 1900, p. 62, records it as from "Amur-Länder." Presumably this means the Amur River basin, near Vladivostok, in Primorsk. The specimen in the U. S. National Museum is from Japan.—A. C. Davis, Takoma Park, Md.

THE DECIDUOUS CUSPS OF THE ALOPHINI (COLEOPTERA—CURCULIONIDAE).

By J. Wilcox and Wm. W. Baker,
Bureau of Entomology, U. S. Department of Agriculture.

The presence or absence of deciduous cusps (accessory mandibles) on the mandibles, leaving a scar, is one of the main characters used in the North American system of classification for separating the Otiorhynchinae from the Curculioninae. The tribe Alophini is placed second in the Curculioninae by Blatchley and Leng[1] and is placed in the Curculioninae (or equivalent group) by all other authors, so far as known by the writers.

While a specimen of *Trichalophus simplex* LeConte was being examined it was noted that a definite deciduous cusp was present on the left mandible. A further check of the material in the writers' collections showed the scar to be present in all genera (*Triglyphulus, Plinthodes, Acmaegenius,* and *Trichalophus*) excepting *Lepidophorus* and *Lophalophus,* and the deciduous cusp was found to be present on the following specimens:

Trichalophus simplex Lec.: Out of four specimens from Medicine Hat, Alberta (F. S. Carr), two collected on April 21, 1928, had the cusp present on the left mandible.

Trichalophus didymus (Lec.): Out of thirteen specimens collected by the writers in the ground about the roots of strawberry plants at Austin, Whidby Island, Wash., August 15, 1931, four have both cusps present, two have the left cusp present, and two have the right cusp present. One specimen from Tacoma, Wash., March 15, 1932 (Baker), has the right cusp present. One specimen from Everett, Wash., January 15, 1929 (Ed. Hunter), collected on strawberry, has the right cusp present. Three out of twenty-three specimens collected at Cle Elum, Wash., May 21, 1933 (S. E. Crumb and Wilcox), have the cusp present on the left mandible.

Trichalophus brunneus Van Dyke: Six of seventy-five specimens collected at White Swan, Wash., May 21, 1933 (Crumb and Wilcox) have the cusp present on the left mandible.

Plinthodes taeniatus (Lec.): One specimen collected at Cle

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[1] Blatchley, W. S., and C. W. Leng. 1916. "Rhynchophora or Weevils of North Eastern America." The Nature Publishing Co., Ind., p. 144.

Elum, Wash., May 14, 1933 (Crumb), has the left cusp present.

The cusps of most of the Otiorhynchinae seen by the writers are rather long and sharp pointed. The cusps of *Trichalophus* are flattened, rectangular, about one and one-half times as long as wide, usually rounded at the apex, and the right one is considerably larger than the left one (1 1/2 times as long and 1 1/3 times as wide). The right one is attached to the ventral, inner, apical surface and usually extends obliquely mesad below the left one; the scar is long, narrow, and oval but is not so readily seen as the left scar. The left cusp extends almost straight out from the mandible and is attached to the outer half of the narrow apical surface, the scar being rather long and narrow, somewhat triangular.

Apparently, from the above records, the right cusp is usually the one lost first. It would appear from these data that the four genera *Trichalophus, Plinthodes, Triglyphulus,* and *Acmaegenius* of the tribe Alophini should be transferred to the subfamily Otiorhynchinae. Keifer[2] has recently shown primary structural differences between the larvae of *Trichalophus* and *Lepidophorus.* Four species of *Alophus* from Europe were examined and found to possess the scar.

The writers are indebted to L. L. Buchanan, of the Division of Identification and Classification of Insects, Bureau of Entomology, for suggestions and for the loan of specimens of *Lophalophus inquinatus* Mann. from the U. S. National Museum; and to C. W. Getzendaner for the photographs in the accompanying plate.

EXPLANATION OF PLATE IX.

1. *Dyslobus decoratus* (Lec.) with both cusps present, an example of a typical Otiorhynchid.
2. *Plinthodes taeniatus* (Lec.) with the left cusp present.
3. *Trichalophus didymus* (Lec.) with the left cusp present.
4. *Trichalophus didymus* (Lec.) with both cusps present.
5. *Trichalophus didymus* (Lec.) with the right cusp present.
6. *Trichalophus brunneus* Van Dyke viewed from below, showing the left cusp present and the scar on the underside of the right mandible.
7. *Trichalophus brunneus* Van Dyke with left cusp present.
8. *Acmaegenius hylobinus* Lec. showing the scar on the left mandible.
9. *Triglyphulus ater* (Lec.) showing the scar on the left mandible.

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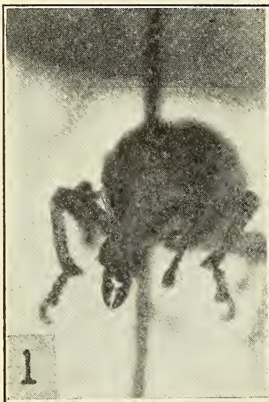
[2] Keifer, H. H. 1932. "Some Pacific Coast Otiorhynchid Weevil Larvae." Entomologica Americana, v. 13 (n. s.), p. 48–49.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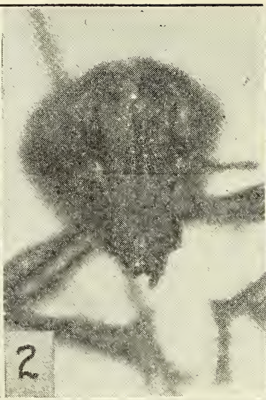
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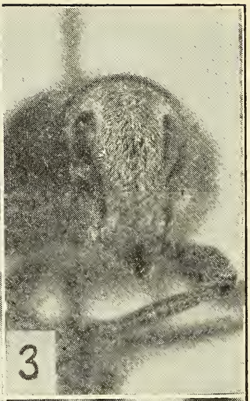
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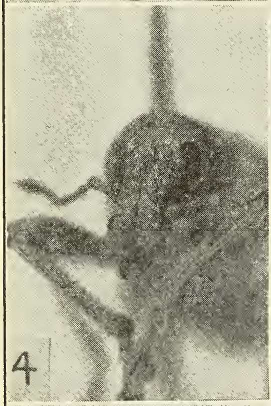
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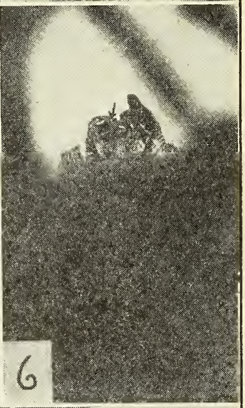
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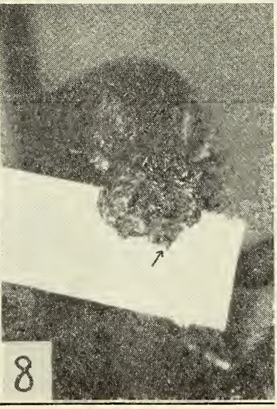
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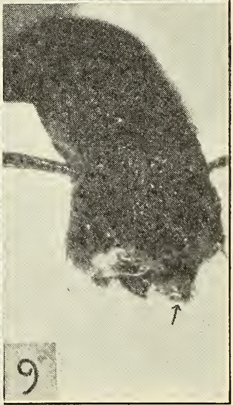
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A NEW ANASA FROM PARAGUAY (HEMIPTERA: COREIDAE).

By Roland F. Hussey, New York City.

In a recent paper[1] I have referred to this species by the manuscript name *Anasa sapiicola,* stating that it is one of three hemipterous forms commonly associated in mid-summer with the Euphorbiaceous tree *Sapium haematospermum.* This plant is of frequent occurrence on the sandy rolling plains of east-central Paraguay, both on the higher land and near the streams, and its range extends well to the south into Argentina: commonly it is known as the *curupí-cahú.*

During my stay in Paraguay in 1931–32, I found this Coreid on no other plant, but in late December and early January it occurs in all stages on the *curupí-cahú.* The adults are found principally on the fruiting branches, and many of them are found in copula. The eggs are deposited singly on the unripe fruit, which at this season resemble miniature green figs with disproportionately long stems, growing in small clusters; and the young nymphs obtain their food from the latex which abounds in the parenchyma of the fruit.

The ova are very similar to those of the North American *Anasa tristis.* They are brown externally, and the inner surface, after the larva emerges, is silvery and shining. In size the ova measure about 1 mm. by 0.75 mm.; they are strongly flattened laterally, and their appearance suggests very strongly a miniature shell of a bivalve mollusc, inserted into the plant tissue at the "hinge" margin. A single fruit of the *curupí-cahú* will often bear sixty or seventy of these ova, which are so firmly attached that they cannot be removed without tearing the plant tissue and starting a flow of the latex.

A description of the insect follows:

Anasa sapiicola n. sp.

♂. Length 14 mm., humeral breadth 5.1 mm. Head: length 1.9 mm., width with eyes 1.9 mm., interocular breadth 1.1 mm.; one-fourth the length of the head lies in front of the apex of antenniferous tubercles. Lengths of antennal segments: I, 1.44 mm.; II, 2.1 mm.; III, 2.1 mm.; IV, 1.5 mm.; first segment stoutest, lightly curved, second and third segments cylindrical, fourth fusiform; first three segments extremely rough, covered with minute closely approximated

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[1] Bull. Brooklyn Ent. Soc. XXIX, October, 1934, p. 133.

elongate elevations, the interstices between these filled with grayish matter giving the impression under low magnification that the antennae are coarsely punctate. Rostrum attaining the posterior coxae; lengths of segments, I, 1.56 mm.; II, 1.44 mm.; III, 1.12 mm.; IV, 1.64 mm.; first segment almost or quite reaching base of head.

♀. Length 15½–16 mm.; humeral breadth 6.1 mm. Lengths of antennal segments, I, 1.56 mm.; II, 2.36 mm.; III, 2.2 mm.; IV, 1.6 mm. Proportions of head as in male.

Coloration. Sordid testaceous, the hemelytra tending more toward whitish, the head, anterior lobe of pronotum, and pleura with a more yellowish tinge; head with two longitudinal black vittae arising at about the level of the ocelli, much narrowed anteriorly, obliquely forked externally, once at about the level of the eye and again on the antero-median margin of the antenniferous tubercles; extreme base of head sometimes black; antennae black, ventral side of first segment and some irregular mottlings on the upper side, extreme base of second segment, and apical portion of fourth segment testaceous, an annulus occupying the basal 1/5 of third segment sordid luteous. Anterior lobe of pronotum with a short, very narrow median black vitta and a small black spot laterad of each callosity; posterior lobe with an obsolete vitta immediately each side of the smooth median line, formed of coarse black punctures on concolorous ground, and a second similar vitta about midway between this and the lateral margin; rarely there is a third, very narrow vitta of the same sort within the lateral margin; lateral margins faintly suffused with reddish. In paler specimens only the median pair of black-punctate vittae may be present, and in no case do they extend forward as far as the callosities. Hemelytra closely but very coarsely—almost foveolately—punctate, the punctures commonly very slightly darker than the ground color; in darker specimens the punctures of the exocorium (especially toward the apex) and the outer apical cell of the mesocorium more heavily fuscous. Veins of corium commonly lightly infuscated, as also a small area beyond apex of basal cell of the mesocorium. Membrane fuscous, shining, the oblique basal cell pale. Connexivum yellow or reddish, the posterior third of each segment black, the black markings interrupted at the extreme edge on the posterior segments by a small yellow dot. Dorsum of abdomen testaceous; apical segment with a square fuscous mark at the center, occupying the entire length of the segment, the two preceding segments more broadly fuscous, their fuscous areas invaded at each side in each segment by a triangular testaceous mark. Legs testaceous, the femora with four to six obsolete fuscous maculae above, the tibiae with fuscous markings which tend to form irregular bands; tarsi fuscous only toward apex of last segment. Propleura with a small black spot and two narrow black lines; meso- and metapleura with a short black line a short distance above the acetabula; anterior and posterior tubercles of ostiolar peritreme black; venter concolorous, margins of abdomen with a minute pre-apical black spot in each segment.

Structural characters: Head and anterior lobe of pronotum finely punctate; antenniferous tubercles unarmed; tylus narrow, distinctly elevated above the jugae and surpassing their apices. Pronotum trapezoidal; anterior width: posterior width: median length (♂) = 16 : 51 : 32; lateral margins nearly straight, subcarinately calloused in front of the rounded humeri and provided with four or five remote small rounded callous nodes on the anterior half or two-thirds, the one next the collum obsoletely bifid; postero-lateral margins sinuate (somewhat more strongly so than in *A. tristis*) and produced to form an obtuse tooth lying distinctly lateral to the scutellum. Calli of anterior lobe confluent in front. Scutellum 1/3 wider than its median length, shallowly transversely rugulose. Hemelytra punctate as described above; venter finely punctate, pleura more coarsely so. Male genital segment oblique as seen from the side, its profile very lightly sinuate near the apex, the dorso-lateral angle rounded, very slightly produced beyond the subtruncate posterior margin.

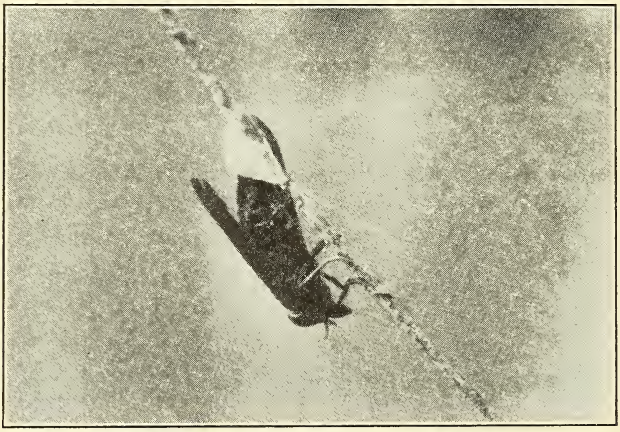
Holotype: ♂. PARAGUAY, Estancia Primera (CaaGuazú District), 2, I, 1932 (R. F. Hussey). *Allotype:* ♀. Topotypic; 31, XII, 1931 (R. F. Hussey). *Paratypes:* 14 ♂♂ and ♀♀. Topotypic; 31, XII, 1931; 2, I, 1932, and 8, I, 1932 (R. F. Hussey). Holotype and allotype in Museum of Zoology, University of Michigan. Paratypes in Museum of Zoology, University of Michigan, Museum of Comparative Zoology, Museo Nacional de La Plata (Argentina), and in my collection.

By reason of the unarmed antenniferous tubercles and the bivittate head this species falls in the division *ee* established by Stål in the "Enumeratio." Many characters separate it from *A. acutangula* Stål, as, for instance, the antennae only half as long as the body, with the fourth segment shortest and the second and third subequal, the very obtusely rounded humeral angles, etc. From *Anasa limbata* Berg, the only other species thus far referred to this division (and which I also obtained in Paraguay) it can be readily separated by the coloration and by the dentiform posterior angles of the pronotum. Otherwise it appears very closely related to Berg's species, which was described from Corpus in Misiones, on the Paraná River, about 200 km. south of the type locality of *Anasa sapiicola*.

THE EGG-LAYING OF THE MOURNING HORSE-FLY, TABANUS ATRATUS FAB.*

By Phil Rau, Kirkwood, Mo.

The larvae of the horse-fly, *Tabanus atratus,* is aquatic, so I was not surprised to see several females ovipositing in a pool of back water on Chestley Island, in the Mississippi River near St. Louis, Mo. The egg-masses were placed on short twigs protruding above the water. In the bright afternoon sunshine of a hot July day, the mothers took positions on the twigs, head downward, pumped the eggs out of the body and simultaneously packed them close together, making a neat egg packet of the mass, as may be seen in the half completed packet shown in the photograph. The eggs were packed very close and adhered to one another. The outside of the packet, even though built up of a layer of these eggs, formed a very smooth wall; it was only with the aid of a magnifying glass that I could see that the egg-mass had no other covering than the outside layer of eggs.



The color of the eggs when deposited was milky white, but after an hour the mass turned a very dark gray, resembling identically the twig upon which they had been placed. In the laboratory one such laying hatched five days later. The tiny larvae dropped from the egg mass into the water of the aquarium, leaving the egg-shells in their exact positions in compact mass; from its appearance one could hardly detect that so an important event had occurred.

These notes were made on July 27, 1930, but the period of egg-laying for this *Tabanus* is comparatively long for when I visited the area five weeks later, I again found many mothers ovipositing.

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* Identified by Mr. Alan Stone.

NOTES ON PYCNODERES QUADRIMACULATUS GUÉRIN (HEMIPTERA, MIRIDAE) IN THE VICINITY OF TUCSON, ARIZONA.

By Lawrence Paul Wehrle, University of Arizona, Tucson.

On November 4, 1931, the writer collected the squash capsid (*Pycnoderes quadrimaculatus* Guérin), attacking beans on the Old Farm of the University of Arizona.

In August, 1933, C. B. Brown, County Agricultural Agent, found *Pycnoderes quadrimaculatus* Guérin injurious to squash and pumpkins near Tucson, Arizona. He observed that the insects attacked the lower sides of the leaves most and that the leaves turned gray as a result. This was the first time he had observed an infestation of this insect.

On September 28, 1934, the writer observed *Pycnoderes quadrimaculatus* Guérin in large numbers on Mexican red beans or pink beans (*Phaseolus vulgaris* Linn. var.). This insect punctures the leaves and in sucking out the juices removes a portion of the green chlorophyll. The upper side of the leaf becomes greenish gray in color. On the lower side of the leaf numerous irregularly placed black specks of excrement are found. Leaves of cultivated watermelon (*Citrullus vulgaris* Schrad.) and muskmelon (*Cucumis melo* Linn.) which had evidently been injured by this insect were found.

On October 6, 1934, *Pycnoderes quadrimaculatus* Guérin was present in large numbers on wild African watermelon (*Citrullus vulgaris* Schrad.) near Tucson, Arizona. This watermelon is native to tropical Africa and South Africa.

The identity of *Pycnoderes quadrimaculatus* Guérin was verified by Mr. J. R. de la Torre-Bueno. The identifications of Mexican red bean, cultivated watermelon and muskmelon were made by Professor J. J. Thornber. The name and information concerning the wild African watermelon was received from Mr. F. J. Crider. While the cultivated watermelon and the wild African watermelon bear the same scientific name the two kinds of melons appear quite distinct.

We thank the friends who sent us short notes for these little spaces.

BOOK NOTES.

A Monograph of the Collembola of Iowa. By Harlow B. Mills. (Pp. i–xi + 1–143, pls. I–XII, containing figs. 1–189. The Collegiate Press, Inc., Ames, Iowa. $2.25.)

Here we have the first monograph in over 30 years of these curious primitive insects. The treatment is entirely taxonomic, except for an occasional brief biological statement. Doubtless this lack is caused by the absence of adequate treatment of these minute insects from the life-history standpoint. This idea at once points the way to further most valuable studies, with the work before us as a solid foundation. Indeed, without such a work as this to tie to, biological studies of given species would contain a certain element of indeterminacy.

The plates and figures are clean-cut and extremely informing. They demonstrate the great advantage of line plates over photographs, however well the latter may be reproduced.

The monograph covers 132 species known to occur within the State of Iowa, 45% of which, incidentally, are either holarctic or cosmopolitan. The keys cover all the Palaearctic and Nearctic genera.

The extensive bibliography (93 titles) as might be expected from the character of the monograph, is practically wholly taxonomic.

All these remarks are not to be taken as in any way minimizing the importance of this fundamental work; they are made to point out the paucity of our biological information about a most widespread and common group. The next line of attack on the problems of this much neglected albeit highly interesting group—a group which from its primitive nature should be a source of knowledge on the origin, metamorphosis and instincts of the Class Insecta—should be directed toward their biology.

The press work is excellent; and the binding is substantial and very adequate for a book of such constant reference as this should be. J. R. T.-B.

The Distribution of Trichobaris insolita Casey.—Through the kindness of Mr. Sam Kelly, the writer has received three specimens of *Trichobaris insolita* Casey, reared from Physalis (ground cherry) in Kansas. Leng, in his check list, and Blatchley and Leng, in their work on Rhynchophora of North Eastern America, record this species only from Florida. In addition to the Kansas specimens, the writer has two specimens from Illinois, one collected at Havana, and the other without definite locality.—Wm. P. Hayes, Urbana, Ills.

EDITORIAL

RECIPROCITY.

(*All authors MUST read this!*)

Current conditions seem still to be with us. Science, to which so much lip-service is rendered, is perhaps one of the chief sufferers. The scientific worker, whose labors are not directly transmutable into $$$, has been one of the leading victims of the world-wide dislocation. He, the chief support of scientific groups, has seen his income pared to the core. In consequence, he has had to resort to drastic economies; and the first to bear the brunt have been his associations and scientific publications. The latter, naturally, have had to retrench; and the liberal spirit of old is much on the wane.

The Brooklyn Entomological Society is forced at last to join the ranks: at least, it must mark time.

So, very reluctantly and sadly, of course, its publications must adhere to our announced old rule, to accept MSS. for publication—at least in the BULLETIN—from two classes of authors only: namely, from the members of the Society and from its subscribers. This is and has been a standing rule of our Society, even though not always insisted upon. But now the surfeit of excellent papers on all hands makes possible a selective policy.

Further, we purpose to demand certain standards and to follow certain well-defined trends. No articles on exotic faunas will be accepted, except they be of outstanding importance, biologically or taxonomically. Descriptions of single species, or of varieties, forms, or other minuter subdivisions will not be published, except in general discussion of a group and carrying clear, definite, positive indication of their affinities and of their differences from their similars; and with their exact position in the taxonomic scheme.

In the matter of cuts and plates, no more than one of either will be accepted with any article, except by special arrangement. It is also very desirable that where possible authors should purchase such cuts from us at our very reasonable cost—much less by far than the usual engraver's price for single cuts. If not, we will sell them to anyone who wishes to purchase them; or we will destroy them forthwith.

In the matter of reprints, we will adhere to our announced policy so long as we can. But we do urge authors who can use reprints to order more than the 25 gratis copies. The cost of reprints to us is about 35% of the cost of any one number of the BULLETIN; in the course of a year we have a reprint item of some $200, or the total amount of 80 subscriptions!

And finally, no author's corrections, that is, changes in the text after it is in type, will be permitted. All papers must come to us in complete and final form, ready to be set in type as they stand.

These may seem harsh conditions, but it is not we who make them; they are the unescapable result of a world-condition.

As ever, we will be merciful—but not too much so.

The Publication Committee of the
Brooklyn Entomological Society.

TO OUR FRIENDS.

The Brooklyn Entomological Society, as you all know, has always pursued a liberal policy in matters of publication. This has had a sure consequence: we have a great accumulation of complete sets and odd numbers of the new series of our publications, as well as a goodly number of reprints of ENTOMOLOGICA AMERICANA. Our storage space is necessarily limited; and we are now on the verge of overflowing. Consequently, we must greatly decrease this stock. Before eliminating this too large surplus, we are offering reprints at greatly reduced prices during 1935 only. This is a great opportunity for authors to control their own reprints; and for libraries, institutions and individuals to secure full sets of our publications or to fill in gaps in their series.

After this sale closes, only full sets of our publications will be sold; and we will offer no reprints of any separate articles.

Take immediate advantage of this offer; and send in your orders promptly to

GEORGE P. ENGELHARDT,
28 Clubway, Hartsdale, N. Y.

A correction:—An unfortunate error crept into Dr. Roger C. Smith's paper on "Hallucinations of Insect Infestation," published in the December, 1934, BULLETIN. On page 212, line 11, the word "Illustrations" should read "Illusions."—The Editor.

PROCEEDINGS OF THE SOCIETY.

MEETING OF MAY 10, 1934.

Present: President William T. Davis in the chair and the following members: Messrs. Engelhardt, Dr. Hussey, Moennich, Nicolay, Ragot, Rau, Sheridan, Shoemaker, Torre-Bueno and Lemmer.

Minutes of the previous meeting read and approved. Treasurer's report received.

Mr. Bueno reported on the BULLETIN and ENTOMOLOGICA AMERICANA.

Mr. Bueno expressed his concern over publications in tongues strange to the nations of the west, showing a Russian one.

Mr. Bueno spoke on Hemiptera captured by Mr. Engelhardt in the state of Washington, etc., in 1933. This article was printed in full in the October BULLETIN. Messrs. Engelhardt and Davis discussed it.

Mr. Nicolay was in the Southern Pines about a month ago.

Mr. Shoemaker showed three boxes of moths.

Mr. Ragot showed *Stenodontes dasystomus* Say from Long Island City, *Hydrobius tesselatus* Zimm. caught at Montvale, N. J., V–6–1934, also some Chrysomelidae from Panama and weevils from New Guinea.

Mr. Rau showed sumac with galleries of some beetles, also Coleoptera from Saratoga Springs.

Mr. Engelhardt showed some Aegeridae with cuttings of the food plants, obtained in Oregon and Washington State in 1933: *Synanthedon praestans* Hy. Edwards, so far only known by the unique male type in Brooklyn Museum. It bores in the crown roots of *Erigonum compositum* and *elatum,* discovered by Jos. Wilcox and S. E. Crumb, of Puyallup, Washington, in 1932. A fine series was bred and adults captured at Ellensburg and White Swan, Wash., in 1933. The moths emerge from late July to late August. *Synanthedon veracunda* Hy. Edwards, recorded from the Rocky Mountains, Colorado to Canada and N. W. Pacific Coast and often confused with *S. nigra,* which possibly is only a geographical race of this species. The food plant is *Lithospermum ruderale,* the larvae boring in the crown root. Ten specimens were bred from one plant, emerging in late July and during August. *Zenodoxus palmi* Neumoegen. Represented until recently by the unique type from Arizona, Brooklyn Museum Collection. Their breeding in the root of Mallow—*Sidalcea nervata*—collected on the Snake River near Pullman, Wash., was a great surprise. A series of some

40 specimens shows no differences sufficient for separation from the Arizona type. The moths emerged during August.

Adjourned.

FREDERICK LEMMER,
Secretary pro tem.

MEETING OF OCTOBER 11, 1934.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 11, at 8.10 p. m. President Davis in the chair and eight other members present, namely, Messrs. Engelhardt, Lacey, Lemmer, Moennich, Shoemaker, Siepmann, Wilford and Dr. Hussey, and Messrs. Dietrich, Gerberg, Kerrish, Siegel and Stecher.

The minutes of the previous meeting were read and approved, and Mr. Engelhardt presented the Treasurer's Report.

Mr. Davis spoke of the death of Mr. Charles Schaeffer, curator of Coleoptera at the Brooklyn Museum, and exhibited a volume of his collected works. A general discussion of Mr. Schaeffer's life and contributions to entomology followed. Various members spoke of how highly he was regarded by other coleopterists, and commented upon his marvelous memory and the thoroughness of his work. The death of Mr. Wurster, also a member, was reported.

Mr. Dietrich reported collecting the beetle, *Oxygonus montanus* Schaeffer (Elateridae), at Slide Mountain, New York, during the past summer.

Cicindelidae and other beetles were collected at Cape Cod, Massachusetts, by Mr. Lacey.

Mr. Lemmer reported that he had made his usual week-end collecting trips, the last few trips bringing him two things new to his collection.

Mr. Shoemaker devoted most of his time to Lepidoptera during the past year. He commented on the large numbers of *Catocala* found on the trees in Bronx Park during July and August, of which he collected 350 specimens representing about 29 species and varieties. Sometimes three hundred or more specimens were seen on a single day. Mr. Shoemaker did not know whether *Catocala* was always so abundant in Bronx Park, or whether this was unusual, since he was not very familiar with the locality.

Mr. Wilford reported *Pieris protodice* occurring at Marine Park, Brooklyn, N. Y., during the past season.

Mr. Stecher said that a small Carabid, probably a *Harpalus,* laid some eggs in his terrarium. The eggs were of large size for so small a beetle, about as large as a grain of rice. Mr. Shoemaker said that the eggs of *Catocala ilia* varied much in size according to the individual laying them, but that the eggs of the other species of *Catocala* did not show any great variation.

Dr. Hussey said he collected the mirid, *Neurocolpus rubidus* Knight in Connecticut, this being the second record for this species. The species was described in the October number of the BULLETIN. He also obtained a specimen of *Trepobates subnitidus* at Lakeville.

Mr. Engelhardt said that the Pacific Coast was hot and dry during the past summer, and that he would make a more detailed report on his trip there at a later meeting. He exhibited a specimen of the Bombylid fly, *Anthrax simpson* Fabr., which he obtained at Hartsdale, N. Y., on August 8, 1934. This species is one of the largest Bombylid flies of the East, and is parasitic upon the larva of the carpenter bee, *Xylocopa virginica.* Mr. Engelhardt also exhibited a living specimen of the Cerambycid beetle, *Tragidion coquus* var. *fulvipenne,* boring in a one year old stalk of the Agave, taken at El Paso, Texas, on August 2, 1934. Two or three specimens of this beetle bore in one stalk. Mr. Engelhardt said that this beetle could be collected in quantities if its habits were known to the collector. Otherwise only one or two specimens might be obtained in a season.

Mr. Engelhardt also made his usual report on the fall canker worm. It was still abundant in Westchester County, but not as much so as the year before. Three species of *Calosoma* were noted feeding upon the larvae, namely, *scrutator, wilcoxi* and *calidum. Wilcoxi* was more common than *scrutator,* which is the reverse of the usual case. The praying mantis was largely winter killed at Hartsdale.

Mr. Lemmer spoke of his visit to Mr. Rummel at Green Village, N. J., and spoke of the traps Mr. Rummel used for capturing moths. These traps consist of a cylinder of wire screen, with a tin cover at the top. Within the cylinder is a cone, also of wire screen, with a small opening at the top. The trap is placed on a raised platform containing some crushed fruit or other substance to attract the moths, which can enter the trap at the bottom, where the bait is. In leaving, the moths fly upward, and through the opening in the cone, into the upper part of the trap, from which they are usually unable to find their way out.

Mr. William T. Davis showed a number of egg-masses of the Mantis, *Tenodera angustipennis,* and also a living female that had been reared during the summer in his garden at St. George, Staten

Island. The egg-masses were found attached to the high-tide bushes along Bass Creek at Oakwood, Staten Island in the spring and early summer of 1934, the first one being detected by Mr. Hans L. Stecher. No young mantids hatched from any of these egg-masses, and later the dried up eggs were found within. It was suggested that they might have been killed by the severe winter of 1933–34. A great many egg-masses of the closely-allied *Tenodera sinensis* resident in the Island since about 1902 also failed to hatch. This species, however, survived the hard winter of 1917–18 as well as the last one, and is no doubt destined to reach still further north especially along the coast. Mr. Roy Latham in a letter dated January 20, 1934, stated that *sinensis* had at last reached the eastern end of Long Island.

The meeting adjourned at 10.05 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF NOVEMBER 15, 1934.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, November 15, 1934, at 8.15 p. m.

President Davis in the chair and eleven other members present, *viz.*, Messrs. Ballou, Cleff, Engelhardt, Lacey, Lemmer, Nicolay, Rau, Ragot, Sheridan, Siepmann and Wilford, and Messrs. Dietrich, Gerberg, Kaiser, Kerrich, Stecher and Tulloch, and Miss Potter.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the Treasurer's Report, and read a letter from Mr. Torre-Bueno regarding the progress of the society's publications, which were placed on file.

Mr. Kaiser reported that in general *Cecropia* and *Cynthia* cocoons are scarce this year in Brooklyn and adjacent Long Island, but that they could be found in certain localities. *Prometheas* are scarce, and, when found, usually parasitized.

The greater part of the meeting was devoted to an exhibition and general discussion of *Catocalas*. Mr. Wilford showed his collection of this genus, and spoke of his collecting trips in company with Mr. Shoemaker.

Mr. Lemmer exhibited his collection of *Catocalas* from Lakehurst, N. J. He obtained 28 species at this locality, not counting forms, and his exhibit included all but three of these species.

Mr. William T. Davis exhibited some Staten Island *Catocalas*.

He also showed three volumes of J. O. Westwood's "new edition" of Dru Drury's "Exotic Entomology," published in 1837; the original edition dating back to 1770–1782. He commented upon this work, volume I being of particular interest on account of the many colored plates of American insects. Mr. Davis's set of this work was formerly in the library of Dr. J. H. Pazos, in South America, and had been damaged by the boring of an insect, probably the larva of the widely-distributed Drug Store Beetle, *Sitodrepa panicea.* The insect made a hole entirely through volumes II and III and went through its last transformations near the end of volume III, where the boring was enlarged. The insect's boring produced some curious results on some of the plates, and Mr. Davis read an account of *Sitodrepa panicea* from Mr. Harry B. Weiss's article on "Insects Injurious to Books," published in the March, 1933, number of *The American Book Collector.*

Mr. Kaiser told of how he reared *Catocalas* and how he obtained the eggs. He would place a female in a large blown-up paper bag, in which was suspended a ball of cotton soaked in honey, to serve as food. The bag was hung up in a room until the moth oviposited.

Mr. Engelhardt commented upon the life-histories of the *Satyridae* and *Hesperiidae,* saying that much still remained to be done in this respect.

Mr. Ragot exhibited the April, 1929, number of the *Book League Monthly,* the entire number of which was devoted to "Instinct and Intelligence of Insects."

The meeting adjourned at 10.00.

Carl Geo. Siepmann,
Secretary.

NOTICE TO SUBSCRIBERS

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BULLETIN

OF THE

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NEW SERIES

SMITHSONIAN INSTITUTION
APR 29 1935
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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXX April, 1935 No. 2

SOME NEW ISSIDAE, WITH NOTES ON OTHERS—(HOMOPTERA-FULGORIDAE).

By E. D. Ball, Tucson, Arizona.

Euthiscia tuberculata Van Duzee described from the Gulf of California region has been taken by the writer from the gray shrubby Verbena (*Lippia wrightii*) in Sabino Canyon near Tucson, Arizona.

Hysteropterum bufo Van Duzee described from the same region has been taken by the writer in a number of places in Sonora, Mexico, and a single female at the High Tanks (Tinajas Altas) in Arizona near the Mexican border.

Hysteropterum sepulcralis Ball n. sp.

Resembles *bufo* but smaller, darker with less elevated lateral carinae of vertex and the median tablet of front broader. Dark brown or gray. Length 3–4 mm.

> Front slightly shorter and much broader than in *bufo,* the central tablets half wider. Clypeus uniformly rounding, not elevated and abruptly angled below as in that species. Vertex parallel margined, concave, the posterior margin much higher than the anterior. Pronotum much shorter than in *bufo,* scarcely as long as the mesonotum, the margins adjacent to eye not elevated as in that species. Elytra with the dorsal line strongly arcuated, a pair of elongated pyramidiform elevations on the claval areas against the scutellum, and usually four small ones in a row across just back of the middle of claval areas. The costal margin of elytra is much narrower just before the angle than in *bufo*.

Holotype ♀, allotype ♂, and 2 paratypes, Bisbee, Arizona, October 14, 1931; 12 paratypes, Naco, October 14, 1931; Tombstone, May 14, 1930, and August 1, 1931. All collected on the tar-bush (*Flourensia cernua* D. C.) by the writer. This species is allied to *bufo* in its single spine on tibia and its sinuate dorsum, but is specifically quite distinct. It resembles var. *utahnum* of *cornutum*, but the long low elevations of the claval areas of that species are also quite distinct.

Osbornia arborea Ball n. sp.

Size and general form of *cornuta* Ball but the vertex angularly produced and the elytra long. Color yellow and green. Length 3 mm.

> Vertex nearly flat, the disc depressed, anterior margin obtusely angulate and definitely carinate, posterior margin deeply angularly excavated so that the two margins are nearly parallel. The lateral angles not elevated as in *cornuta*. Front narrower than in *cornuta* and longer, not extending more than half as far down the sides of the small clypeus, a definite median carina above. Elytra scarcely as wide, and nearly twice as long as in *cornuta* almost covering the abdomen. The abdomen elevated posteriorly but not compressed and inflated on each segment as in the latter species.
>
> Color slightly tawny yellow, the abdomen greenish. Elytra creamy, the scutellar margin often brown, the posterior half of costal and all of the apical margin irregularly marked with smoky or black.

Holotype ♀, and seven paratypes, July 20, 1930; allotype ♂, and 6 paratypes, June 14, 1930; all taken by the author from Juniper, at Patagonia, Arizona.

Hysteropterum cornutum var. **utahnum** Ball n. var.

Size and form of the species nearly, much darker and with the elevation on clavus longer and more acute. Length 3–3.5 mm.

> Vertex and front as in the species, the carinae bounding the eye not as highly elevated. The inner vein of clavus strongly elevated throughout but especially elevated into a pyramid before the apex of mesonotum, the dorsal line correspondingly sinuated. Color gray with dark dots and spots throughout, especially marked on the nervures and sometimes forming a double row of dots across the anteapical cells as in *sepulcralis*.

Holotype ♀, allotype ♂, and 10 paratypes, taken by the writer near the Grand Canyon, August 1, 1930. Typical *cornutum* is ordinarily pale creamy or lighter while this variety, probably from the black sage (*Artemisia cana* Pursh.) would be placed with *bufo* or *sepulcralis* on color but lacks the acute carinae and pyramids of those species.

Aphelonema bivittata Ball.

This species is found more abundantly in Arizona than in the plains region from which it was described. Like *simplex* it becomes highly variable in color in the subtropical environment. Bunn, Jl. Kans. Ent. Soc., 3, p. 74, 1930, described one of these varieties as a new species under the name *convergens* and another as var. *canyonensia* of *convergens.* He gave no structural character that will separate either from *bivittata.* The differences in genitalia are apparently due to position rather than structure. As the writer has pointed out previously (1926) the species in this group have good structural differences while the color variations in the more tropical representatives are extremely numerous.

Aphelonema solitaria Ball n. sp.

Greenish or straw color resembling *viridis* Dozier but larger. Not as large as *nigriviridia* Ball and lacking the black stripes, face much narrower than in either species. Length: ♀, 2 mm.; ♂, 1.5 mm.

> Vertex about equalling the pronotum in length much narrower than in *viridis* with the truncate portion in front very narrow, less than a third of the length of the oblique margin, instead of equalling it as in *viridis* or *nigriviridia,* the disc definitely below the carinate margins. Pronotum and mesonotum relatively flat, the carinae little elevated. Median compartment of front elongate, one-half longer than wide, instead of wider than long as in the allied species, narrowing above where it is only one-fourth of its apical width. Lateral compartments widening above with four pustules against the eye and six inside. Four large pustules below the median compartment. Clypeus not inflated and scarcely angled with front.
>
> Color pale straw, the elytra and frontal smoky, the pustulate areas lighter. The abdomen with traces of four brownish stripes. Male colored like the female, which is unusual in this group.

Holotype, ♀, from Madero Canyon, Santa Rita Mts., September 29, 1929 (labeled Tucson). Allotype, ♂, from the east side of Santa Rita Mts., July 11, 1932. Both collected by the writer. The male of this species and a male of *viridis* were taken from the same damp grassy slope under pines and oaks.

Aphelonema orbiculata Ball n. sp.

Resembling *histrionica* Stål. but more definitely marked and with a round median facial tablet instead of an elongated one. Pale straw with a broad dark band on either side arising on the elytra. Length: ♂, 2.7 mm.

Vertex triangular, about equalling the pronotum, slightly more than half as long as the basal width, the angular margin three times as long as the truncate apex instead of about equal as in *histrionica.* Frontal tablet round instead of long egg-shaped with the base truncate as in *histrionica.* Four pustules between the tablet and clypeus instead of two. The lateral compartments very broad above and heavily pustulate, clypeus not inflated, rounding over into a 30° angle with the front.

Color pale straw, the frontal tablet and a broad median stripe occupying one-third of the vertex, pronotum, mesonotum and abdomen and about one-half the elytra, ivory white. The margins of stripe and the median carina of abdomen rusty. The pustular areas on head and mesonotum dark, the pustules light. The outer half of the elytra becoming smoky beyond the hinge and shading to black at the apex where this color is continued as a broad lateral stripe on abdomen with the pustules white. The clypeus except base dark and the femora annulate.

Holotype, ♀, from Mexico City, July 2, 1932, in the collection of the author. Paratype male, Chapultepec, Mex. (Kirkaldy) in the Van Duzee collection of the California Academy of Sciences.

Papagona Ball n. gen.

Allied to *Aphelonema* but much more elongate in form with the vertex as long as wide the eyes enclosing only about half the pronotum and the front triangular, broadest below.

Vertex flat, long and narrow, longer than pronotum, equalling the mesonotum, as long as its basal width. Head with the eyes definitely narrower than the pronotum which is constricted on the anterior half and enclosed by the eyes and then widened and laterally carinate posteriorly, but again exceeded in width by the elytra and abdomen. (In *Aphelonema* the insect is barrel shaped, the head almost as wide as the body.) Pronotum extremely long and narrow, almost as long as wide, the lateral margins carinate and broadly pustulate, mesonotum elongate the lateral carinae extremely high and enclosing a tablet that is much longer than wide. Elytra brachypterous covering over one-half the abdomen, the sutural line depressed in middle, the posterior margin rounding with an inflated area in front on either side. Venation as in *Aphelonema.* Hind tibia with a single stout spine. Face elongate, retreating, forming a 30° angle with vertex. Front the shape of a rather long flat-iron. Truncate with two pustules below. The lateral pustulate areas extremely wide above.

Type of the genus: **Papagona papoosa** n. sp.

Papagona papoosa Ball n. sp.

A gray and brown species with a long vertex, a broad median white stripe and 3 pairs of white spots. Length: ♂, 2.6 mm.

Vertex long, tapering, deeply concave, the postocular carinae of the pronotal flaps rounding, only a little higher than the carinate lower margin. Mesonotum with the median portion flat. Front much longer than its apical width. The lateral margins of the pustulate areas very weakly carinate.

Color pale straw, a broad median white stripe to the apex of the mesonotum narrowing posteriorly. The outer inflated portion of elytra and the median inflated portion of abdomen piceous, a pair of round waxy spots back of the hinge on the elytra, a smaller pair in the saddle, a large pair on outer portion of the first exposed segment and often three approximate dots along the median line. Below and legs dark brown shading out to straw on the front. The coxae and venter pale blue.

Holotype, ♂, taken from the bluffs of the Santa Cruz River near Tubac, Arizona, August 6, 1932. Paratype male in the same spot, May 13, 1932. Both swept by the author from a clump of joint grass (*Muhlenbergia porteri*).

Papagona succinea Ball n. sp.

Resembling *papoosa* but with a shorter head, a depressed mesonotum. Of a rich amber color without the median stripe. Length: ♂, 2.5 mm.

Vertex definitely shorter than in *papoosa,* with the apex more bluntly rounding, the disc almost flat with the marginal carinae raised, instead of deeply concave as in that species. Mesonotum with the lateral carinae of the central tablet close together, strongly arched and with a deep V-shaped depression between. Frontal tablet definitely broader and more rapidly narrowing than in *papoosa,* the bounding carinae of the pustulate areas elevated in front of the eyes. The postocular carinae of the pronotal flap definitely angled posteriorly. Color rich reddish amber, the smooth surfaces translucent, the pustulate areas waxy and paler. Three pairs of large white spots and 3 pairs of small approximate ones on abdomen as in *papoosa.* The legs brown, the coxae creamy.

Holotype, ♂, and two paratype males, April 4, 1933; three paratype males (and a female nymph), April 14, 1934; all taken by the writer on a small clump-grass (*Triodia mutica* Benth.) in the Tucson Mountains, Arizona, and one paratype male taken April 10, 1931, in Sabino Canyon of the Santa Catalina Mountains, Arizona.

NOTES ON THE DIURNAL LEPIDOPTERA OF THE CANADIAN ARCTIC COLLECTED BY OWEN BRYANT IN THE SUMMERS OF 1929 TO 1932.

By R. A. Leussler, Omaha, Nebraska.

With Introduction and Field Notes
By Owen Bryant, Tucson, Arizona.

II.

As comparatively little collecting has been done in the regions visited by Owen Bryant, and described in the foregoing introduction, it was thought that a list of butterflies found on his trips would be of interest to Lepidopterists.

It is with that thought in mind that the following list is offered, together with such notes and comments as will be helpful to an understanding of the species found, and how they compare with published figures of some of the species, and with the original description in the case of others.

In studying this material, which Mr. Bryant sent me for mounting and determination, and in comparing it with material from other regions, and searching the literature dealing with Arctic butterflies, I have become impressed with the great diversity of forms produced in the various regions of the North American Arctic. Clearly much collecting and study is needed before a correct understanding of the relationship of the various forms and their specific value can be arrived at.

I wish to acknowledge the assistance of Dr. J. H. McDunnough in clearing up some of the more difficult determinations for me, and here express my sincere thanks for his valuable help.

The localities in which collections were made have been fully described in the introduction but for the sake of convenience they are briefly listed below:

Churchill, Man., on west shore of Hudson Bay, 58° N. lat.
Herschel Island, Yukon Terr., in Beaufort Sea, 70° N. lat., 139° W. long.
Shingle Point, Yukon Terr.
Ft. McPherson, N. W. Terr., on the Peel River, 12 miles above the Husky River.
Aklavik, N. W. Terr., 68° N. lat., 135° W. long.
Base Camp, 25 miles southwest of Aklavik.
Black Mountain, 30 miles southwest of Aklavik.

And a locality 50 miles northeast of Aklavik.

The classification used is in general that of Barnes & Benjamin's list of March 20, 1926.

1. *Papilio machaon* race *aliaska* Scudder.

A fair series of this handsome Papilio was taken at the base of Black Mountain between June 26 and July 15, 1931, and up to 2200 ft. on the mountain.

The specimens agree quite well with Barnes & McDunnough's fig. 2, Pl. IV, Contributions, Vol. III, No. 2. Some variation in the width of black borders of secondaries is observed in the series. Also variation in the size and shape of the submarginal yellow spots; in some specimens these spots are crescent shaped while in others they are larger and more quadrate. The orange spot at anal angle of hind wings is large and uniformly round, and on the under side of fore wings the submarginal yellow spots are fused together so as to form a continuous band. These two latter characters are constant in all of the specimens of the series.

It is an extremely active butterfly and while the earliest specimens collected were fresh most of them had already suffered some wing damage. Those collected July 15, were all badly battered. In the series there was but one female, taken July 15, in battered and mutilated condition.

According to Bryant this species has the habit of sitting among the rocks on the very highest rocky knobs or on gravelly knolls with its wings expanded but pressed down and generally with the right wing toward the wind. At the time of observation the wind was from the south and possibly the butterflies adopted the attitude described because it brought their heads towards the morning sun. They seemed always to sit with one wing toward the wind and both wings pressed downward so that the wind passed over their backs without having much effect. When active they dropped down to the lower levels to feed upon the flowers growing there and then returned to the very highest knobs.

Caterpillars, apparently of this species, were found at the base of the mountain on a composite with leaves like rhubarb (*Petasites frigidus*). They were pale green with black markings and yellow scent organs like those of *asterias,* which they extrude when annoyed. They pupated in August.

2. *Ascia napi* race *arctica* Verity.

A long series was taken at Aklavik and Base Camp, July 1 to 18, 1931. There is considerable variation in the series, especially among the females; some specimens are quite typical while others approach *pseudobryoniae* (Verity). Most of them, however, are very close to *arctica* as illustrated by B. & McD., Contributions, Vol. III, No. 2, figs. 6 & 7, Pl. VI.

Arctica is said to occur in the inland Arctic region (Barren Lands) while *pseudobryoniae* is said to occur along the Alaskan coast. As the locality from which the present specimens came lies between the Barren Plains and the Alaskan coast it is but natural that they should intergrade somewhat. They doubtless should all be referred to *arctica.*

3. *Colias hecla* race *glacialis* McLach.

A good series of both sexes from Churchill, June 25, Herschel Island, July 20, 1930, and from Base Camp and Black Mountain, 500 ft. and 2,000 ft., June 26 to July 24, 1931.

Strecker described *C. hecla* from Ft. Churchill where many of the present specimens came from and with which description they agree. Dr. Gibson in Rep. Can. Arct. Exp. lists Herschel Island as one of the localities where *hecla glacialis* has been taken and gives a very complete description of the specimens.

This description also fits the specimens from the above localities and suggests that *hecla* and *glacialis* are probably one and the same thing or at least without much difference. If so, the name *glacialis,* having priority, stands. Dr. McDunnough who has kindly compared one of the Churchill specimens with a series of *glacialis* from Baffin Land, states that he can detect no great difference. Neither is any real difference apparent between the Churchill specimens and those from the other localities named above.

There are two dimorphic females from Base Camp which are probably form *pallida* Skin. & M. One of these is dull whitish in ground color while the other is a very pale creamy-yellow.

They however have rosy fringes whereas the original description of *pallida* from Greenland states "fringes of all wings milky white."

There are also three males from Base Camp with extremely narrow fuscous borders and with the ground color a very pale orange. These are puzzling. They may be merely aberrant individuals or may be a distinct form. Seitz's ♂ fig. of *hecla,* Macro. Lep., Vol. 5, Pl. 27, shows borders nearly as narrow as in these three specimens.

4. *Colias eurytheme* form *eriphyle* (Edw.).

3 males from Black Mountain, 500 ft., July 24, 1931. The upper side is clear yellow with narrow black borders and a well

defined round black discal spot on primaries. On the secondaries there is a prominent orange spot and there is fairly heavy dusting of black along inner margin. On the under side the secondaries, as well as the costa and apices of primaries, are a deep ochre-yellow, and the secondaries are somewhat dusted with dark scales. The discal spot of secondaries on this surface is silver circled with rusty red.

5. *Colias gigantea* (Stkr.).

3 males from Churchill, June 25, 1930. *Gigantea* was described from the west coast of Hudson Bay north of Ft. Churchill and I think there can be no doubt that the Churchill specimens are that form. The upper surface agrees pretty well with *gigantea* from Bilby, Alberta, except that in two of the specimens the dark borders are narrower. On the under side the secondaries are more greenish than the Bilby specimens.

Gigantea is generally listed as a race of *christina* but Dr. McDunnough (Can. Ent., Vol. LIV, No. 6, page 135) regards it as a distinct species, basing his conclusion upon a difference in habits of the mature insect and a difference in food plants of the larvae.

6. *Colias pelidne* (Bdv. & Lec.).

One male and 1 female from Base Camp, July 15, and 1 female from Black Mtn., 500 ft., July 24, 1931, all worn; also 2 females from Base Camp, July 21, 1932. These are larger than Labrador specimens and also larger than the race *minisni* Bean, being as large as the larger *skinneri* Barnes. They have a pale orange discal spot on secondaries and the under side of secondaries is but lightly dusted with black. In other respects they show definite *pelidne* characters.

7. *Colias palaeno* race *chippewa* Kirby.

A series from Churchill, Man., June 25, 1930, and several specimens from Base Camp, July 11 to 24, 1931. Specimens agree with Holland's figures; also with Edwards's figure of *helena* from Mackenzie River, which has been determined to be synonymous with *chippewa.* In the series there are but 3 females, all from Base Camp. Of these, 2 are the normal pale females and one is the bright yellow form described and named *kohlsaati* by J. D. Gunder in Bulletin of the Southern California Academy of Sciences, Vol. XXX, Pt. 2, p. 45 (1931).

8. *Colias nastes* race *rossii* (Gn.).

Four specimens from Herschel Island, July 20, 1930. They have a somewhat faded appearance. The upper surface is a dirty yellow-green with a faint suggestion of a pale orange on the primaries. The under side is rusty blackish at base with the outer margin rusty yellowish. They agree quite well with Holland's figure in the Revised Butterfly Book.

9. *Colias nastes* race *subarctica* McDunnough.

A fair series of both sexes from Base Camp, July 11 and 15, and from Black Mtn., 500 ft., and 2,000 ft., July 24, 1931. The males without exception have the entire upper surface of primaries blackish with only narrow but clearly defined yellow-green dashes in margin. The secondaries also are very dusky but less so than primaries. The females show some variation in size, in the amount of dark suffusion and in the discal spot on upper side of secondaries. In two of the females this spot tends to orange but in most of them it is white or very pale yellow. A careful comparison of the specimens with Dr. McDunnough's original description of race *subarctica* from Bernard Harbour (Can. Ent., Nov., 1918) leaves no doubt that they are that race.

10. *Coenonympha kodiak* race *yukonensis* Holland.

Specimens of this prettily marked *Coenonympha* were taken at Base Camp, July 11 and 15, and on Black Mtn., at 500 ft. and 2,000 ft., July 24, 1931. The species was fairly common in open places and not very active. There is some variation in the series; most of them, however, agree with Holland's figures of the types and all of them are sufficiently close to leave no doubt as to their identity. Holland states that *yukonensis* may prove to be a distinct species. Judging from the specimens and also from Holland's figures I am inclined to believe that *yukonensis* is more nearly allied to *inornata* than to *kodiak*.

11. *Oeneis jutta* Hbn.

A single specimen (♀) from Base Camp, July 11, 1931. An extremely dark form both in ground color and in the fulvous area surrounding the ocelli. These fulvous areas are greatly restricted. On the under side the same darkening prevails, with the apex of primaries and the outer third of secondaries washed with a considerable amount of greyish. It is totally different from the race *alaskensis* Holland, and race *reducta* McDunnough, from Wyoming. It also differs from Labrador and Alberta specimens, most nearly approaching specimens from Mer Bleue, Ont., being however considerably darker than these.

12. *Oeneis cairnesi* Gibson.

One male and 3 females from Base Camp, at 500 ft. elevation, July 15 and 24, 1931. The male agrees with Gibson's fig. 6, Pl. IV, of the upper surface but is slightly more tawny.

One female is of about the same shade as the figure cited, while the remaining two females are lighter. The under side of the male agrees very closely with fig. 7, Pl. II, but in addition to the one ocellus of primaries between veins 5 and 6 shown there is a second smaller one between veins 4 and 5 and a minute dot between veins 2 and 3. The under side of the three females varies somewhat in the denseness of striations and the distinctness of the band, but one of them is almost identical with Gibson's fig. 8, excepting that in addition to the one ocellus shown on primaries there are three others, smaller and more or less indistinct, the one between veins 3 and 4 being a mere dot. This greater number of ocelli on primaries holds good in the remaining two females, each having 3 ocelli and a dot. As variation in the number of ocelli is common in the genus *Oeneis* I attach no great importance to this discrepancy. The secondaries in all four specimens have the 4 ocelli mentioned in the description and shown on the plates.

A careful reading of the original description leaves no doubt in my mind that the four specimens from Base Camp are the same species as the four specimens from the White River district, Yukon Terr., to which Dr. Gibson gave the name *cairnesi.*

At the end of the description is this significant statement: "Before describing the above I submitted a specimen to Dr. Dyar with a request that he compare it with his species *O. nahanni.* This he very kindly did, reporting that it differed chiefly from his species in being too light in color, in having no ocelli on hind wings above and the markings on these latter wings being more of an open character."

Before seeing the figures and descriptions of *cairnesi,* but having compared the specimens before me with the description of *nahanni,* I too conjectured that they were very close to that species if not actually lighter colored individuals of the same species.

I suspect that both *cairnesi* and *nahanni* are closely related to *uhleri* and *varuna.*

13. *Oeneis taygete* Gey.

A small series, both sexes, from Churchill, June 20 and 22, 1930, and 3 males from Base Camp, June 22 and 24, 1931. The upper side of these specimens agrees with Holland's figure, and they also have the white veins on the under side of secondaries and black median line on under side of primaries mentioned by Dr. McDunnough (Can. Ent., VI, 1922, page 136) as distinguishing characters. The specimens from Base Camp are a trifle larger than those from Churchill, and the white veining on under side of secondaries is more striking.

14. *Oeneis polixenes* Fabr.

A series of specimens from Churchill, June 20 to 25, 1930, has given me considerable trouble to place. After much study and checking of the characters of the specimens with the original description of various species and comparison with published figures I was still uncertain as to their identity.

Dr. McDunnough to whom examples were submitted kindly helped me out of my dilemma. He stated "by genitalia they belong in the *polixenes* complex and are half-way between *brucei* and the var. *yukonensis* Gibson, the under side agreeing quite well but the upper side lacking distinct yellow submarginal dots; the upper side being more like Labrador *polixenes* but the under side of secondaries in this race generally shows much less white shading beyond median band."

The series shows considerable variation in the color of the upper surface, some of the specimens being fairly brown with a reddish tinge, while most of them resemble Holland's figure of *katahdin* (Newc.). On the under side there is considerable variation also. In some of the specimens the median band is fairly dark and well defined, while in others it is less so. Also the light areas on either side of the median band are more pronounced in some specimens than in others.

It would seem best to regard the series as intergrades rather than create a new name.

15. *Oeneis melissa* race *semidea* Say.

Three males and 1 female from Churchill, June 20, 1930. These specimens are slightly darker and somewhat smaller than New Hampshire specimens but do not otherwise differ from them.

16. *Erebia discoidalis* Kirby.

Two males and 2 females from Base Camp, June 24, 1931, and several males and females from Aklavik, July 1, 1931.

These specimens are apparently quite typical. They do not differ materially from Alberta specimens. The only difference that can be observed is that on the under side the apex of primaries and outer half of secondaries is more hoary. In this respect they agree with one specimen from Chatanika, Alaska, with which they have been compared. The difference however is slight.

17. *Erebia fasciata* Butler.

One male from Herschel Island, July 20, 1930, and 2 males from Base Camp, June 24, 1931. *E. fasciata* is such a well marked species that there is no mistaking it, but as the 3 specimens depart somewhat from the typical some comment would seem to be in order. In the Herschel Island specimen the ground color is far from being black; it is not even dark brown; dull brown of a medium shade better describes it. On the primaries it has an oblong dull red spot between veins 1 and 2, another between veins 2 and 3, and a faintly indicated partial spot between veins 3 and 4. On the under side both the dark mesial band and the light submarginal band are as shown in Holland's fig. 6, Pl. LXI, but the basal area and the light submarginal band are greyish brown instead of stone grey. On the primaries this band is tinged with rufous. The entire under side is less contrasty than the figure cited.

The two specimens from Base Camp are much darker on the upper surface, in fact they appear black until compared with *E. magdalena* Stkr. when it is seen that the ground color is a very deep blackish-brown. The oblong spots are as in the Herschel Island specimen but these spots are a brighter, more decided red. On the under side these two specimens differ from the Herschel Island one and also from each other. The median and marginal bands are extremely dark in both. On one of them the bands are shaped much as in Holland's fig. 6 and are of the same width as shown in that figure, but on the primaries the submarginal band is decidedly dark rufous and on the secondaries it is a silvery grey, much sprinkled with brownish scales.

In the other Base Camp specimen the submarginal band is quite narrow, scarcely wider than in Holland's fig. 7 of *avinoffi,* and the dark median band is correspondingly wider, but in shape these bands are those of *fasciata* and not of *avinoffi.* The submarginal band is dark rufous on the primaries, and silvery grey on the secondaries, less heavily sprinkled with brownish scales than the preceding specimen.

Dr. Holland in New Species of Erebia, Trans. Am. Ent. Soc., LVI, 149–153, calls attention to the considerable varietal difference found in *fasciata* and suggests that some of the forms may ultimately prove to be valid subspecies if not species.

More material is needed from the above localities before it can be safely determined whether the differences described represent mere individual variation or whether they constitute valid subspecies.

18. *Erebia rossii* Curtis race **ornata** new race.

A good series of this *Erebia* was obtained at Churchill, June 15 to 20, 1930. The series shows a certain amount of variation in the number, size and shape of ocelli but all of them show increased spotting, and in other respects also differ sufficiently from typical *rossii* as well as from the Alaskan race *kuskoquima* Holland to warrant a name.

> Male. Upper side of wings uniform seal brown of medium shade, fringes paler, indistinctly checkered, antennae ochreous; on the primaries the two subapical spots, which in the typical form are separate, are fused into one large rufous spot with a more or less irregularly shaped black center; between this and the inner margin are two smaller rufous spots with black pupils.
>
> On the secondaries there are three rufous spots in a curved row, the one nearest anal angle being largest and containing a black pupil.
>
> On the under side the ground color of primaries is rusty red, from the base outward; the subapical spot of this wing is reproduced but the black center is divided into two twinned spots, each with a tiny white pupil. Of the other two spots on primaries only the one situated between veins 1 and 2 is reproduced on the under surface. None of the spots of secondaries is reproduced on this surface. The extra discal pale band of secondaries is rather obscure, and on the outer edge of this band there are three tiny yellow dots.
>
> Female. This sex differs from the male only in having both the ground color and the rufous spots paler. The spots are somewhat larger and more conspicuously pupiled. The extra discal band on under side of secondaries is only a trifle lighter in this sex than in the males.
>
> Expanse: Male 48 mm., Female 46 mm.

The above description is that of the male holotype and female allotype.

In the series, consisting of 16 males and 9 females, there is variation in the number and size of spots. In some of the males the subapical spot of primaries is divided into two twinned spots, and some of them have but one additional spot on this wing. On the secondaries the rufous spots vary from one to four, three being the usual number. None of the females have less than two spots on primaries in addition to the large fused spot in the subapical area. Not one of the entire series, either male or female, has secondaries without spots.

For this race from the Churchill region of the Hudson Bay country, which differs from typical *rossii* and the Alaskan race *kuskoquima* in the rather constant tendency of the subapical spots of primaries to coalesce and the quite constant character of spotted secondaries in the males as well as the females, I propose the name *ornata.*

All the specimens of the series, other than the holotype and allotype are designated paratypes.

19. *Erebia youngi* Holland.

A few specimens of both sexes from Base Camp, July 11, and Black Mountain, 500 ft., July 24, 1931, all somewhat the worse for wear. These agree quite well with the figures of the types in Holland's Revised Butterfly Book, Pl. LXI, but are somewhat larger, the ground color is darker, and the submarginal spots are of a deeper orange color. They match fig. 10, Pl. IV, Can. Arct. Exp., excellently.

Unlike the series of *rossii,* the specimens of *youngi* show practically no variation in spotting.

20. **Erebia herscheli,** n. sp.

Three males from Herschel Island, July 20, 1930. One specimen which will be designated the holotype, is in good condition, with the exception of a slightly torn right fore wing. The other two, designated as paratypes, are considerably frayed.

> Holotype. Male. Upper surface of wings a peculiar drab brown with a slight satiny gloss. On primaries there are four pale indistinct rufous spots arranged as in *E. youngi,* but considerably smaller, and pupiled with a pale fuscous dot.
>
> On the secondaries there are two very small pale rufous submarginal spots with pale fuscous dots in the centre. These spots are quite indistinct.
>
> The under surface is slightly darker on the inner two-thirds of both wings; on the primaries there is a pale rufous submarginal band which does not quite reach either the costa or the inner margin. In this margin the four fuscous dots of the upper side are reproduced. On the secondaries there is a submarginal band paler than the inner two-thirds of the wing.
>
> The antennae are pale ochreous. Alar expanse 40 mm.

Altogether this is a very obscure little insect. It may prove to be a local race of *youngi,* although it is a decidedly smaller and different looking insect.

One of the paratypes is practically a duplicate of the type, while the other is still more weakly marked.

In this connection it may be of interest to recall that the single specimen of *E. fasciata* taken on Herschel Island is also of a shade of ground color quite similar to that of these specimens.

21. *Brenthis aphirape* race *alticola* B. & McD.

A male from Aklavik, July 1, and a female from Base Camp, July 15, 1931, fit the description of *alticola* in having the upper side pale with the basal shading reduced and the black markings narrow and cleanly cut. On the under side the spots are unsilvered, pale cream colored except the marginal row which are whitish with a faint suggestion of silver. This butterfly was not common and seemed to prefer the vicinity of woods.

The first of these specimens was captured by Corporal Fielding's daughter Doris.

22. *Brenthis aphirape* race *dawsoni* B. & McD.

One male from Churchill, June 25, 1930, also 1 male from Herschel Island, July 20, 1930. These two specimens although coming from widely separated localities are nevertheless identical. They approach most nearly race *dawsoni* described from Ontario but they do not have as broad black borders as shown in Holland's figure of the male.

23. *Brenthis chariclea* race *arctica* (Zett.).

A long series of this little *Brenthis* from Herschel Island, July 20, 1930, and from Base Camp and Black Mtn., 500 ft. and 2,000 ft., throughout July, 1931. Many of the specimens show the effect of having been buffeted by winds.

This is apparently a common butterfly north of the Arctic Circle and I can do no better than to repeat what Dr. Gibson has said of this species in Rept. Can. Arct. Exp., 1913–1918: "Looking over the above series there is of course considerable variation among the specimens, not only in the general color of the upper surface of the wings, but also in the arrangement and color of the markings on the under side. The median band particularly on the underside of secondaries shows marked variation." All of this applies perfectly to the series before me. I would add that as a general thing the spots on under side are well silvered, that a tendency to melanism is present particularly among the females some of which are very considerably suffused with blackish, and finally that in a few of the males the entire surface of the hind wings beneath, except the silvered spots, is reddish-brown—*butleri* Holland. I infer therefore that *butleri* is an aberrant form rather than a geographical race.

24. *Brenthis pales* race *alaskensis* Holland.

A single specimen (male) from Black Mtn., at 2,000 ft. alt., July 24, 1931. The upper side agrees in all respects with fig. 5, Pl. V, Rept. Can. Arct. Exp., 1913–18, and the under surface is quite unlike any other North American *Brenthis,* agreeing pretty well with Seitz' fig. 67 i., Palearctic Fauna, in having the peculiar arrangement of the silver spots, the yellow median band of secondaries, and primaries with the black band and spots of upper side showing only faintly through on the lower surface. The brownish basal area and submarginal band of secondaries are less reddish than in the figure cited, and the yellow median band is continued almost to the inner margin. In these latter two characters the under surface of secondaries resembles Seitz' fig. 68 b of *graeca.*

An interesting character in *pales alaskensis* is the long thick hair which clothes the upper surface of the wings at the base, and on the hind wings along the inner margin.

25. *Brenthis freija* race *tarquinius* Curtis.

A few worn specimens from Aklavik, Base Camp and Black Mtn., 1,000 ft. alt., July 1 and 11, 1931. Not noticeably differing from those from the Banff region excepting that the brown color on under side of secondaries is somewhat deeper in tone and the black markings on upper side somewhat heavier. This, however, does not hold good in all of the specimens, some of them being intermediate.

26. *Brenthis polaris* (Bdv.).

Specimens from Aklavik, July 1, 1931, Base Camp, June 22, and Black Mtn., 2,000 ft., July 24, 1931, and Herschel Island, July 20, 1930. Specimens were also observed up to 3,000 ft. on Black Mtn.

Apparently this species is not common, for only a few specimens were obtained from the above localities. That it also is an early butterfly is indicated by the fact that those taken June 22 and July 1 were quite fresh while those taken after that date were badly worn.

Dr. Holland states that Alaskan specimens of this species are generally lighter in color on the under side of secondaries than specimens taken in Labrador and that these lighter individuals have been named *americana* by Strand. Dr. Th. Lehman in Seitz'

Macro Lep. states that Strand described the Greenland form as *americana,* and Dr. McDunnough in Can. Ent., Vol. LX, No. 11 (Nov., 1928) also states the name *americana* was based on Greenland material and states further that *groenlandica* Skin. has priority over *americana* Strand. He adds "There is considerable variation in the amount of black suffusion on the upper side (notably in the ♀) and the maculation on the under side of secondaries and I am doubtful whether the distinguishing characters given by Strand for this race will always hold good." In the light of this uncertainty it seems best to refer the specimens under consideration simply to *polaris.* In order, however, to give a clue to their correct identity I should state that on the under side they are not as dark as Labrador individuals, and not nearly as dark as Seitz' fig. 71e, Palearctic Fauna.

27. *Brenthis frigga* race *saga* (Staud.).

Half a dozen specimens were taken at Churchill, June 20, 1930. These are considerably worn and not much can be said regarding them except that they average slightly larger than Labrador specimens but do not otherwise differ from them.

They definitely are not race *alaskensis* Lehmann = *gibsoni* Barnes & Benj.

28. *Brenthis frigga* race *gibsoni* Barnes & Benj.

A single specimen (male) taken at Aklavik, July 1, 1931, is tentatively placed here, although it does not altogether fit the description of *gibsoni.* It is *not* larger than Labrador specimens of *saga,* nor is the basal area on upper side darker.

The black median band, however, is heavy and the marginal border lightly marked. The blackish suffusion of the basal area of secondaries does not reach the median band but is restricted to basal half of the cell and the markings of both wings are clean cut. In these latter respects it fits the description of the Colorado race *sagata* described by Barnes & Benjamin in Can. Ent., June, 1923. The locality from which the specimen comes, however, would make it seem more likely that it is *gibsoni.*

29. *Brenthis frigga* race *improba* (Butler).

A small series from Herschel Island, July 20, 1930, and from Black Mtn., 500 ft. and 2,000 ft., July 24, 1931.

This small form is generally listed as a race of *frigga* but may quite possibly prove to be a distinct species.

While the markings on both surfaces are quite similar to those of *frigga,* its uniformly very small size, dull, dark greasy looking upper surface and pale washed out under side with scarcely a trace of purplish tint would seem to support the theory of a distinct species. Another fact which points that way is that the specimen of *frigga gibsoni* was taken in the same general locality as *improba* and Bryant found that *frigga* actually occurred within 25 miles of *improba* without the slightest tendency for the two to intergrade in size or coloring.

Among the Black Mtn. series there are several which approach the description of *B. youngi* Holland, in that the outer portion of the wings is fulvous, but it is a dirty fulvous rather than a bright fulvous, and they also lack the bright fulvous under side shown in Holland's fig. 28, Pl. LV, they being a rather dull fulvous.

A strange circumstance is that these somewhat fulvous specimens came from the higher altitude.

30. *Brenthis distincta* Gibson.

Two specimens (1 ♂ and 1 ♀) from Black Mtn., 500 ft., July 11 and 15, 1931.

A comparison of the specimens with Gibson's fig. 12, Pl. IV (Rept. Can. Arct. Exp., 1913–18), of the under side and his description of the insect leaves no doubt about the identity of the above specimens. On the under side the pale areas are whiter than in the figure of the type, but I note that Dr. Gibson states that in one of the two paratypes this is also the case. The male from Black Mtn. has an alar expanse of 48 mm. and the female 50 mm.

Dr. Gibson in his description states that *distincta* is close to *B. alberta,* but compares it also with *astarte.* Judging from the two specimens before me it is my opinion that it is rather closer to *astarte.* Although duller on both upper and under surface than that species, and entirely lacking the bright red surrounding the median band of light spots on under side of secondaries, it is still possible to trace out the *astarte* pattern of markings in *distincta* notwithstanding that only two of the spots of the median band so prominent in *astarte* are at all whitish in *distincta,* and these a dull dirty white instead of the clear white of *astarte.*

It seems to be a true mountain form occurring only, so far as Bryant's observation went, on the ridge leading to Black Mtn. at about 500 ft. And it must be remembered that 500 feet on Black Mountain is an Arctic alpine region characterized by ground birch, prostrate willows, one to two inches high, and a typical alpine flora such as is found on the mountain tops of the Canadian Rockies.

31. *Phyciodes campestris* (Behr.).

Three specimens, Base Camp, July 20, 1931. Very similar to *campestris* from California. Also one specimen, July 27, 1932, apparently of this species but so badly worn and torn that its identity cannot be established with certainty.

32. *Polygonia faunus* (Edw.) race **arcticus** new race.

A series of 7 males and 7 females of this *Polygonia* was taken May 18, 1931, in grass, and on the border of woods about a lake at the base of Black Mountain, near Aklavik, N. W. Terr.

These are the first butterflies collected on the trip although some *Polygonia* were observed May 13, on the slope of Black Mtn., at 500 to 1,000 ft. altitude.

Although probably hibernated the specimens are quite fresh and clean looking. They are much smaller than typical *faunus* and much greyer on the under surface. In fact, they resemble the Rocky Mountain form *hylas* more closely than typical *faunus*. I regard this Arctic *Polygonia* worthy of at least a racial name and propose for it the name *arcticus*.

> Holotype. Male. Upper side of wings reddish fulvous at base, shading off to a pale yellow fulvous towards apex of primaries. Borders of primaries dark fuscous, cleanly set off from remainder of wings; on secondaries this border is not as dark and shades off into reddish fulvous. The black spots arranged as in *faunus, rusticus* and *hylas*. The submarginal light spots, particularly those of secondaries, are exceedingly pale and clear cut, making them stand out conspicuously.
>
> Under side: basal area brown mottled with grey, the brown being intensified on its outer edge; borders of primaries brownish, defined inwardly by a black wavy line, inside of which there is a series of greenish crescents; this dark border does not quite reach the inner margin of wing and fades perceptibly before reaching the apex. Borders of secondaries not as dark as those of primaries and less clearly defined; through this dark border runs a series of greenish crescents in a row parallel to the outer margin of wings, and these crescents are surmounted by light grey. The space between the dark basal area and the dark submarginal border is light grey traversed by very fine brown lines. The discal silver mark of secondaries is slender with the upper limb slightly bent, and the lower one straight and short.
>
> The contour of both fore and hind wings is less incised or dentate than either typical *faunus* or *hylas*, and the tails are short and blunt much as in *gracilis*.

> Allotype. Female. Upper side similar to male, with the submarginal light spots a trifle larger. Under side almost uniform grey brown, with the submarginal area only slightly darker than remainder of wing. Discal mark of secondaries exceedingly slender.
>
> Expanse: Male 48 mm. Female 48 mm.

The remaining 6 males and 6 females, which I hereby designate paratypes, are very similar to the above types, the only variation worth mentioning being that in two of the females the under side is slightly more contrasty.

A few additional specimens were taken July 1 and 20. All of these, however, were badly worn and battered.

33. *Polygonia gracilis* (G. & R.).

One specimen, Black Mtn., 1,000 ft., June 12, 1931, one taken at base of Black Mtn., June 20, and two at Aklavik, July 1, 1931. All worn, having the appearance of hibernated specimens. Undoubtedly all of *Polygonia* north of the Arctic Circle are single brooded. Apparently the fresh specimens make their appearance during the latter part of the brief summer and hibernate shortly afterward, as specimens of the small Arctic *faunus* taken May 18, were fresh and clean looking while all *Polygonia* taken later in the season up to July 20 were badly worn.

The above specimens are identical with specimens from Dawson, Yukon Terr., Chatanika, Alaska, and Circle, Alaska.

34. *Aglais j-album* (Bdv. & Lec.).

A single specimen was taken at Norman, N. W. Terr., Sept. 1, 1932. Quite typical but small (expanse 66 mm.) and the tails rather short and pointed.

35. *Aglais antiopa* race *hyperborea* Seitz.

One worn specimen from Aklavik, July 1, 1931. Agrees perfectly with fig. 93f, Seitz Macro Lep., Vol. V, in its smaller size, lighter ground color, white marginal band sprinkled with blackish and in having the black submarginal band enclosing the blue spots, more clearly set off from the rest of the wing than in the typical form. The under side is paler and has an indistinct curved pale band crossing both wings.

36. *Lycaena dione* (Scud.).

One male specimen bred from larva collected at Tilley, Alta., just before starting to go north. Quite typical.

37. *Lycaena helloides* race *florus* (Edw.).

Seven females from Base Camp, July 27, 1932. These were taken on flowers of *Potentilla* and are much worn. They are small, measuring 28 to 32 mm., and quite dark, with the fulvous submarginal crescents of hind wings obsolescent.

38. *Everes amyntula* (Bdv.).

A small series was taken at Aklavik, Base Camp and Black Mountain, July 1 to 24, 1931. The specimens are all worn.

The males are quite dark purple above and both sexes are more greyish beneath than typical *amyntula* from California and Vancouver Island, with the black spots small but distinct.

They are also smaller, and in fact seem intermediate between *amyntula* and *comyntas* in some respects.

39. *Plebejus scudderii* (Edw.).

Two females from 50 miles northeast of Aklavik, August 9, 1930. Although captured in the same locality and on the same day, they are quite unlike each other. One seems nearest race *kodiak* (Edw.) while the other is very much nearer race *aster* (Edw.) in appearance. It resembles that form in size and in the black spots on the margin of the wings and in the entire absence of orange lunules and black crescents on the upper side of hind wings. The color of the upper surface is a dull purplish-blue with fuscous only on margin of primaries and costa of secondaries. The under side, however, is more like a weakly marked *scudderii* or *kodiak*.

A good series of *scudderii* from this region would most likely prove exceedingly interesting.

40. *Plebejus aquilo* race *suttoni* Holland.

A small series from Churchill, June 25, 1930. Males silvery grey above, females smoky grey. On under side all the markings are more sharply defined and blacker than in specimens of *aquilo* from Labrador, reaching the costa of hind wings as described by Dr. Holland. The black spots on under side of primaries are prominently ringed by white, making them stand out conspicuously. In size these specimens average a trifle larger than Labrador *aquilo*.

41. *Plebejus aquilo* race **bryanti** new race.

From Black Mountain, 500 ft. altitude, there are 2 males, captured July 24, 1931, which differ from all of the described forms of *aquilo*. They are larger than race *suttoni*, measuring 26 mm. and 28 mm., respectively. On the upper side they are a dark smoky blue-grey, with still darker margins somewhat on the order of *rustica* (Edw.). On the under side the primaries are like *suttoni* but the secondaries are practically devoid of black spots, the white spots standing out prominently against the dark brown ground. There is also one female, extremely dark blackish-brown on upper surface, but with under surface identical with that of the 2 males.

This specimen was reared from a red and green slug caterpillar collected by Bryant, June 20, on Black Mtn. at 2,000 ft.

The mature insect emerged July 10, and is dwarfed.

For this new race I propose the name *bryanti* in honor of Mr. Owen Bryant, who discovered it and whose tireless work in the field of entomology has contributed much to our knowledge.

There is a fourth specimen, a male, captured also on Black Mountain at 2,000 ft. on the same date as the foregoing males, which strangely enough is a pale silver grey above, and resembles *rustica* beneath. This may be an aberrant individual.

Aquilo, like many of the blues, seems to vary greatly according to locality.

42. *Plebejus saepiolus* (Bdv.).

A few specimens were taken at Aklavik, July 1, and at Base Camp, July 15, 1931. These are small and come nearest to race *insulanus* Blackmore, but are paler and duller looking above. They fit the description of *amica* Dew. somewhat indifferently.

43. *Plebejus optilete* race *yukona* Holland.

A small series of this pretty and interesting little blue from Black Mtn., 500 ft., July 11 to 24, 1931. The specimens are quite typical, agreeing perfectly with Holland's figures; the color of the upper side and markings of the under side are so characteristic that there is no mistaking the species.

44. *Glaucopsyche lygdamus* race *couperi* Grt.

About a dozen specimens taken at Aklavik and Base Camp between June 24 and July 20, 1931. The males are very pale silvery blue above, and fairly dark beneath, with black spots on both wings distinct and ringed with white. They agree most nearly with Holland's figures of *afra* Edw. on Plate LXXIII of the revised Butterfly Book. The females vary in the amount of fuscous of upper surface, and also in the degree of dark color of under side. This is another of those blues which change their appearance with nearly every change in locality.

45. *Lycaenopsis pseudargiolus* form *marginata* (Edw.).

One male from Base Camp, June 17, and 3 males and 1 female from Aklavik, July 1, 1931, the latter already badly worn. The Base Camp specimen has the brown spots at base of secondaries somewhat enlarged but not fused so as to form a blotch as in form *lucia.* One worn female from McPherson, July 27, 1932, has these brown spots somewhat fused.

46. *Pyrgus centaureae* Ramb.

A single specimen taken at Base Camp, July 11, 1931. This is somewhat smaller than Labrador specimens. Ground color of upper surface a more decided black; the white spots smaller, those of primaries clear cut. Under surface very dark, the white spots clear cut and prominent. It is the only Hesperiid taken in the four seasons' collecting in the Arctic.

SUMMARY.

While each of the localities in which collections were made by Owen Bryant has peculiar conditions of its own, as pointed out by him, and which may affect their respective fauna, it is thought that for the purposes of a summary of the butterflies collected, these localities may be divided into three divisions, namely: Churchill, Man.; Herschel Island, Yukon Terr.; and Mackenzie Region, N. W. Terr.

At Churchill the following species were taken:

Colias gigantea
Colias palaeno chippewa
Colias hecla glacialis
Oeneis taygete
Oeneis polixenes
Oeneis melissa semidea
Erebia rossii ornata
Brenthis aphirape dawsoni
Brenthis frigga saga
Plebejus aquilo suttoni

On Herschel Island the following were found:

Colias hecla glacialis
Colias nastes rossii
Erebia fasciata
Erebia herscheli
Brenthis aphirape dawsoni

Brenthis chariclea arctica
Brenthis polaris
Brenthis frigga improba

And in the Mackenzie Region, where most of the collecting was done, were found:

Papilio machaon aliaska
Ascia napi arctica
Colias hecla glacialis
Colias eurytheme eriphyle
Colias pelidne
Colias palaeno chippewa
Colias nastes subarctica
Coenonympha kodiak yukonensis
Oeneis jutta
Oeneis cairnesi
Oeneis taygete
Erebia discoidalis
Erebia fasciata
Erebia youngi
Brenthis aphirape alticola
Brenthis chariclea arctica
Brenthis pales alaskensis
Brenthis freija tarquinius
Brenthis polaris
Brenthis frigga gibsoni
Brenthis frigga improba
Brenthis distincta
Phyciodes campestris
Polygonia faunus arcticus
Polygonia gracilis
Aglais j-album
Aglais antiopa hyperborea
Lycaena helloides florus
Everes amyntula
Plebejus scudderii
Plebejus aquilo bryanti
Plebejus saepiolus
Plebejus optilete yukona
Glaucopsyche lygdamus couperi
Lycaenopsis pseudargiolus marginata
Pyrgus centaureae

In the summer of 1933, Mr. A. T. Harper, of McCready, Man., collected at Churchill, and in the month of July took some species of butterflies not met with by Mr. Bryant, whose collecting there did not extend into July.

Merritt Cary in his paper "On the Diurnal Lepidoptera of the Athabaska and Mackenzie Region, British America," Vol. XXI, Proc. U. S. Natl. Museum, pages 425–457, includes a fairly large number of species not encountered by Bryant, many of them, however, from the Athabasca District, not as far north as the region where Bryant's collecting was done.

In the valuable paper referred to, Merritt Cary also includes a Bibliography of works dealing with the butterfly fauna of Arctic America, which the reader will find of great interest.

An Infestation of Blissus leucopterus in the Catskills.—During the summer of 1932, this species was found in grassy places in no great abundance—in ones and twos here and there. On September 3, however, my field notes say it was fairly abundant at Onteora, 2 miles from Tannersville. On July 22, 1933, I was told, with the usual vague description of an insect by a non-entomologist, of an insect that was destroying lawns, which, to judge from these descriptions, might have been the Oriental beetle. It turned out to be the chinch-bug. The bugs were to be found in enormous numbers on the lawn of one of the places, from very young to last instar nymphs, but no adults, nor any of their predators. Up to this date the weather locally had been exceedingly dry for some six weeks. Again, on July 27, I found at the same place great numbers of nymphs, but no adults. The grass of this lawn was badly destroyed. Among these myriad nymphs I found one *Pagasa fusca* nymph and one *Orius insidiosus*. From this time on the seriousness of the infestation was obvious to everyone. On the dry and destroyed greens and fairways of the golf course they were in all stages. With them were to be found great numbers of the predatory lygaeid *Geocoris bullatus* Say. The bugs were still active and numerous into early September. On the other hand, at Tannersville, two miles away, they were to be found only occasionally. In the summer of 1934, however, *Blissus* was again uncommon—so much so that only one was found in early July. This possibly was because of the extreme low temperatures of the preceding winter—during 61 days the temperature did not rise above 0° at Tannersville.—J. R. DE LA TORRE-BUENO, Tucson, Arizona.

A NEW VARIETY OF ANOPLODERA VITTATA FROM NEW YORK (COLEOPTERA: CERAMBYCIDAE).

By George J. Rau, Staten Island Institute, Staten Id., N. Y.

Anoplodera vittata var. **saratogensis** n. var.

Type male, Saratoga Springs, N. Y., June 25, 1934.

Allotype female, same locality, same date.

Collection, Staten Island Institute of Arts and Sciences.

This variety closely resembles *vittata* Oliv. except in color, the legs and antennae are pale and the underside of the abdomen in some specimens is also variously pale instead of black. It may be more exactly described as follows:

> Length. Type, 10 mm.; Allotype, 12 mm.; body long and narrow, underside of abdomen pale except the terminal segments. In the six paratypes—five males and one female—two have the underside of the abdomen nearly pale and four the abdomen variously pale and black. The legs and antennae are almost wholly pale in all eight specimens; in some the femora are spotted with black. Underneath slightly and minutely punctured with the abdomen covered with silky hairs. Head thickly punctured. Antennae as in *vittata* except in color. Scutellum triangular. Elytra thickly punctured, punctures arranged in rows, approaching the apex they decrease in size. The reddish-yellow stripe from the middle of the base of the elytra, extending more than half way toward the apex, is as in *vittata*.

The writer has examined about 450 specimens of *vittata* from numerous localities in a number of collections, but has not found any like those here described from Saratoga Springs where evidently this form has become established. Specimens of variety *saratogensis* have been collected, one on June 2, 1933, and again in 1934, four specimens on June 23, two on June 25, and one on July 2. They all came from the same small area both in '33 and '34, although specimens of *vittata* have been collected a few miles away. There are several synonyms of *vittata* and the original descriptions of these have been gone over but no mention of a form with pale legs and antennae has been found.

In "Memoirs of the Coleoptera," 4, 1913, p. 257, Casey described the genus *Strangalepta* with *vittata* Oliv. as type. In this species there is a remarkable male tibial character that had not previously been mentioned, "the hind tibia of that sex is broadly angulated within just behind the middle." The character is present in the variety *saratogensis* by which use the sexes can easily be separated.

I have before me a male specimen with the elytra, legs, antennae and the underside of the abdomen entirely reddish-yellow. Swaine and Hopping in their "Lepturini of America North of Mexico" (Bull. 52) make mention of having seen "two specimens with the elytra almost entirely testaceous."

Notes on Habits of Neides muticus Say.—Nymphs were first found from July 12 on; and adults from July 20. One group of nymphs was observed from July 14 to 25, 1934—a period of 12 days. On the first date six nymphs were found perched and feeding on the stem of the small deep orange composite, Hawkweed. They were apparently in the last nymphal instar. Wandering about on the ground were younger nymphs, seemingly about the 2nd instar. The next day, only three of the larger nymphs were seen, so another nymph was moved from a grass blade to the flower with the others. One of those already there fought the newcomer—a sort of wrestling—and chased it to another part of the plant, where it began to feed. The day following, four of them were found on the same flower-head, and so up to the 20th, when two were found transformed to the adult. There were at this time still four nymphs about, three being of the original group and one a stranger in the 3rd instar. On the 23rd another of the older nymphs reached the adult. By the 24th there were two more adults and their cast skins on the stem of the little plant. And likewise several more nymphs had migrated to it. This continued to the 25th, when the plant was stepped on and the bugs then disappeared. From that date on, both adults and nymphs were found here and there in small numbers. In the latitude of New York, this species lingers into late fall. It is also noteworthy that *Jalysus spinosus* was not to be found in Onteora.—J. R. de la Torre-Bueno, Tucson, Arizona.

THE GRASS–CARRYING WASP, CHLORION (ISODONTIA) HARRISI FERNALD.

By Phil Rau, Kirkwood, Mo.

One species of grass-carrier wasps, *Chlorion* (*Isodontia*) *auripes,*[1] is found in St. Louis County, occupying the old burrows of the carpenter bee, *Xylocopa virginica,* and using long antennaed grasshoppers for prey. Recently a sister species of southern nativity, *Chlorion harrisi,*[2] with similar habits was taken at Wickes, Missouri. One nest of the latter, in an upright hollow stem, was placed in my back yard where it gave forth five adults and where its progeny thrived for three successive years. An examination at the same time of about 200 other dried stalks nearby gave no additional nests.

In my garden the progeny of this one colony readily nested in the horizontal and vertical hollow stems and in the glass tubes that were set out for them. In addition they also used the horizontal burrows in boards that had been abandoned by the carpenter bee, *Xylocopa virginica.*

It is interesting to note that most of the members of the genus *Chlorion* dig their burrows in the soil, and according to Dr. Bequaert (Bull. Brooklyn Ent. Soc. 25: 122, 1930) only four species in America and one in Europe have so far strayed from the primitive habits as to select pre-existing cavities for their nests. Grass carrier wasps use blades of grass, which they press into a compact plug and use for partitioning the long tunnel into cells; when the cells are completed they use the same material for plugging the entrance opening. These blades of grass are carried in the jaws one at a time, as may be seen in fig. 1. This photograph shows a mother *C. harrisi* at the opening of the nest with a long strand of grass. Fig. 4 shows the nest of the same species in one of the glass tubes that had been set out for their use; here the paper covering which kept the tube dark is partly pushed back, and shows among the grassy bed a cocoon of this wasp.

The prey of *harrisi* are the long-antennaed orthoptera similar to those taken by *C. auripes.* These are paralyzed by stinging, and held under the body while the wasp flies to the nest. In the nest an egg is deposited on one of the grasshoppers and in this species it

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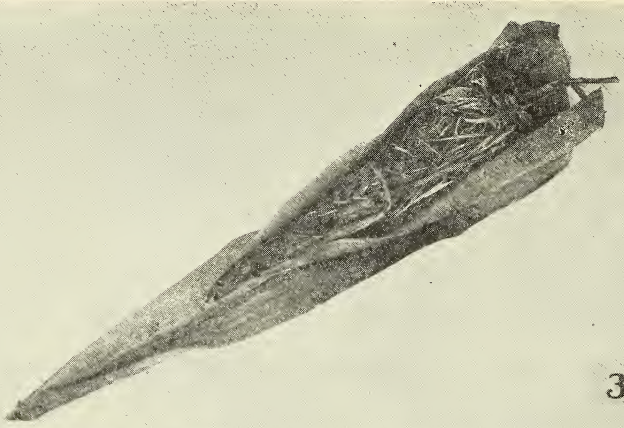
[1] An account of *C. auripes* may be found in Trans. Acad. Sci. St. Louis 25: 362–369. 1928.

[2] Identified by Dr. Grace Sandhouse.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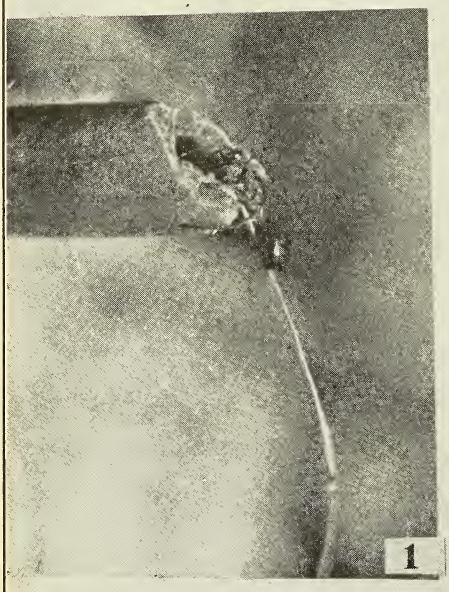
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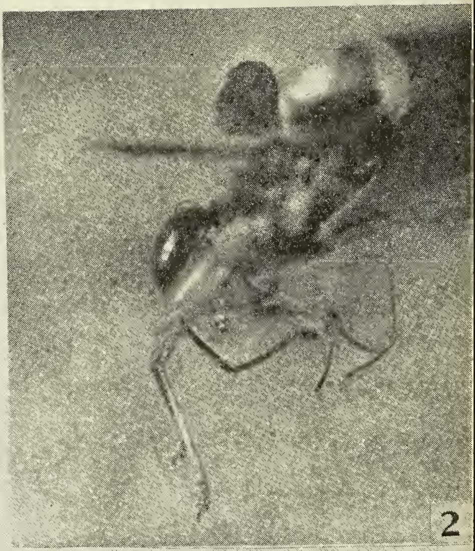
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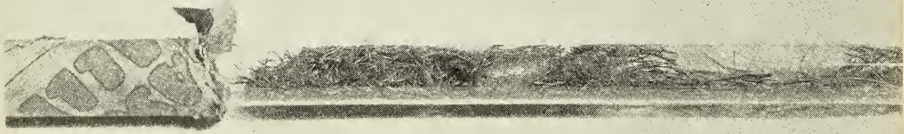
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is cemented on the femur of the left hind leg, where it cannot readily be lost or injured.

Fig. 2 shows a mother struggling to get a large many-legged prey into her nest. The prey taken is not always so large, however, for often small insects are captured; usually the smaller the size of the prey, the larger the number in each cell. For instance, on June 6, 1930, in two cells, two and one-half inches and two inches in length, thirty-two and thirty-eight individuals were counted. All but five were nymphs in the first instar, and all were, according to Mr. A. N. Caudell, of one species belonging to either the genus *Orchelimum* or *Conocephalus*. The five larger ones referred to were identified by him as belonging to two species, *Scudderia* sp. and *Conocephalus* sp. In addition to these, on one occasion a male snowy tree-cricket *Oecanthus 4-punctatus* Bueten., was taken from an incoming *harrisi* mother. The latter seemed dead when taken but next day it revived sufficiently to slowly move the legs and antennae when touched, and it was also able to pass excrement. It continued to do all this until its death nine days later. Mr. Geo. Engelhardt records (Bull. Brooklyn Ent. Soc. 28: 269–271, 1928) *harrisi* in Texas storing spiny katy-dids *Rehnia spinosa* sometimes measuring three to four inches in length, and in nests brought to me by my wife from Tifton, Georgia, September 1, 1932, I found four small nymphs of both sexes of *Conocephalus fasciatus* Degeer (A. N. Caudell).

The nesting habit of *harrisi* is sufficiently plastic so that they easily make use of any ready-made domicile, and the mother wasp always cleans out the old burrow before she begins her own nest; sometimes she kicks out the debris and lets it fall to the ground and sometimes she pushes it back in the horizontal twig as far as it can go, before she brings in her own nesting material. Grass plugs at the opening and partition plugs in the tunnel vary in size, but they are usually from one-fourth inch to two inches thick; sometimes the partition plugs are definitely plugs and sometimes they are mere bundles of grass upon which the prey with egg is placed. Engelhardt found this species nesting in the tubes formed by the folding of the yucca leaves in the drying process, and at Tifton, Georgia, they make good use of the pitcher plant for nesting purposes. My wife found hundreds of wasps nesting in this manner at Tifton, Georgia; and fig. 1 illustrates one such pitcher opened to show the nest. Specimens of the pitcher plant were identified by Dr. Edgar T. Wherry as *Sarracenia minor*. Dr. Wherry in his letter mentions the "white areoles" on the rear wall of this plant and says "On the theory of natural selection it has been suggested that these white areas let light into the pitcher and thereby encourage insects to enter."

In the St. Louis region there are probably two generations each year. The wasps that overwinter in the cocoon are actively engaged in nest building early the following June, and on one occasion a nest gave forth four adults during the last week of July; this indicates two generations per year. One larva was seen to spin its cocoon on June 13, 1930. The cocoon is of silky texture and of a light cream color when spun, but it soon becomes dark brown and very leathery in texture. This change is probably due to the veneering of excrement that the inside of the cocoon receives, when the alimentary tract is emptied by the larva preparatory to pupating.

Chlorion harrisi is not exempt from parasites; from one cocoon a hymenopterous parasite *Eurytoma bicolor* Walsh (A. B. Gahan) emerged on June 6, 1930, and from another nest about a dozen specimens of a dipterous insect *Pachyophthalmus signatus* Say (J. M. Aldrich) emerged. The pupal cases of this fly were lodged among the wing remains of the Orthopterous prey. There was no evidence of a wasp cocoon present so the indication is that the fly larvae fed either on the orthopterous prey or on the wasp larvae and not on the wasp in the pupal stage. From another nest of *C. harrisi,* I obtained a dipterous cocoon, which eventually gave me an adult *Pachyophthalmus floridensis* (J. M. Aldrich). The parasitic enemies enter the nest while it is in course of construction. The tightly packed plug is placed at the entrance after the damage is done. There is also another type of damage unwittingly done to the population by other species of wasps that nest in the top portion of the twig. By building mud partitions at the top of the nest they make a living tomb of the *harrisi* population at the bottom, because the newly adult *Chlorion* wasps are unable to bite their way through the mud walls. A case of mortality of this kind was actually caused by the mud carrying Eumenid wasp, *Odynerus foraminatus.*

Notice.—Title page and Index for vol. 14, *Entomologica Americana,* are bound in with no. 4, vol. 14.

THE TIGER BEETLES OF SOUTH CAROLINA WITH THE DESCRIPTION OF A NEW VARIETY OF TETRACHA VIRGINICA (L.) (COLEOPTERA: CICINDELIDAE).

By O. L. Cartwright,* Clemson College, S. C.

Data concerning South Carolina tiger beetles presented in the following notes have been obtained with few exceptions from specimens collected during the past eight years by the writer and other members of the entomological staff of Clemson Agricultural College and the South Carolina Experiment Station.[1] Although not over three or four localities have been thoroughly worked, it is believed that the list includes all species occurring within the borders of South Carolina.

The distribution of the various species by counties is presented in Fig. 1. The accompanying table present summarized data showing the seasonal distribution known to date and indicates that South Carolina tiger beetles fall into two seasonal groups, those emerging in early summer and dying in the fall and those emerging in late summer, hibernating as adults, resuming activity the following spring and dying in early summer. The latter group frequently becomes active on unusually warm days through the winter months. The writer ventures the opinion that no South Carolina tiger beetle has more than one brood each year.

The South Carolina list with distributional records, names of collectors other than staff members, and brief notes is as follows:

1. *Tetracha carolina* Linne.

A crepuscular species hiding during the day under boards, weeds, trash, and other protection. Sometimes active in late afternoon, especially on cloudy days. Found frequently under city street lights. Taken infrequently in trap lights, and in Japanese beetle traps.

June 17 to October 18. Common throughout the state.

30 localities: Clemson College, Columbia, Meredith, Pomaria, Anderson (E. S. Prevost), Mt. Pleasant (G. E. Hudson), Bennettsville, Blenheim, Hampton, Estill, Florence (J. E. Webb), Summerton, Beaufort, Loris, Antreville, Monck's Corner, Ridgeland, Walterboro, Greenwood, Edgefield, Georgetown, McClellan-

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* Technical Contribution No. 27 from the South Carolina Experiment Station, Clemson College, South Carolina.

[1] Franklin Sherman, J. A. Berly, D. Dunavan, J. G. Watts, O. L. Cartwright.

ville, Mullins, Gable, Dillon, Fairfax (E. W. Howe), Greenville (H. K. Townes, Jr.), Chesterfield, Spartanburg, and Aiken.

An unusual variation of *Tetracha carolina* is at present represented by a single specimen. This specimen lacks entirely the usual light-colored apical lunule, the lunule area being black in color. No name will be assigned unless the variation should be found in other individuals.

2. *Tretracha virginica* Linne.

Crepuscular. Habits as above.

June 19 to Oct. 3. Much less common than *T. carolina.*

9 localities: Clemson College, Columbia, Meredith, Mt. Pleasant (G. E. Hudson), Anderson (E. S. Prevost), Florence, Dacusville, Greenville (H. K. Townes, Jr.), and York (Louetta Youngblood).

3. *Tetracha virginica* var. **melaena** n. var.

In this variety of *T. virginica* the gold green color of the head, thorax and elytral margins is entirely wanting. No trace of green is present, the variety being pure black. Legs, antennae, and last ventral segment ferrugineous as in typical *virginica.* Punctation, size, and shape all identical with *virginica.* Length of type 18.5 mm., width 6.5 mm.

Described from a series of nine specimens, bearing data as follows: The type male taken by the writer at Clemson College, S. C., 6 Aug., 1932; the allotype female, taken at Salisbury, N. C., 18 July, 1930, by D. Dunavan; paratypes from Clemson College, 11 Aug., 1928, J. A. Berly; 13 Sept., 1930, D. Dunavan; 6 Aug., 1932, J. G. Watts; 7 Aug., 1934, W. P. Hunter, and 8 Aug. 1934, O. L. Cartwright; one paratype from Fredricksburg, Va., 3 Sept., 1889, coll. Wm. D. Richardson, and one from Nelson Co., Va., July 21, 1927, W. Robinson.

Type and two paratypes deposited in U. S. National Museum. Allotype female and five paratypes in writer's collection.

4. *Cicindela purpurea* Olivier.

Taken on roads and bare clay slopes in mountains.

March 16 to June 1 and Aug. 19 to Oct. 12. Not common.

3 localities: Clemson College (S. B. Rochester), a very unusual record—possibly an error in locality label; Sassafras Mtn., Pickens County, 3,500 ft., and Greenville Co. (H. K. Townes, Jr.).

5. *Cicindela splendida* Hentz.

Occurs on bare clay slopes and roads in mountains.

March 20 to May 15 and Sept. 25. Not common.

4 localities: Walhalla (The Tunnel), Russels, Rocky Bottom (E. R. Kelly), and Jocassee.

6. *Cicindela duodecimguttata* Dejean.

Frequents usually dark colored steep banks overhanging streams and level wet sand bordering streams having steep banks. One specimen dug from shallow two inch upward sloping burrow in steep clay bank one hundred yards from water at Clemson College, March 1, 1933, by writer.

March 1 to May 18 and Aug. 14 to Sept. 21. Common in upper part of state. No specimens taken east or south of Richland and Kershaw Counties.

20 Piedmont localities: Clemson College, Columbia, Antreville, Honea Path, Walhalla, Anderson, Gaffney, Greenville, Duncan, Chester, Fort Lawn, Lancaster, Kershaw Co., Greenwood, Six Mile, Saluda Co., Rocky Bottom, River Falls, Abbeville, and Clover.

7. *Cicindela repanda* Dejean.

Often abundant on sandy margins of streams.

Jan. 22 to June 30 and Aug. 14 to Oct. 21. Very common and abundant in and above Piedmont area of the state. Rare east and south of line drawn through Marlboro and Aiken Counties.

38 localities: Clemson College, Columbia, Jocassee, Anderson, Honea Path, Sumter, Meredith, Camden, Tomassee, Walhalla, Salem, St. Paul, Old Pickens, Rocky Bottom, Gaffney, Spartanburg, Greenville, Clover, Chester, Fort Lawn, Lancaster, Duncan, Greenwood, Pinnacle Mtn., Bethune, McBee (S. W. Bromley), Richland, Six Mile, Leesville, Saluda, Kingstree, Gramlin, Long Creek, Buffalo, Fairfield Co., Nichols, Abbeville, and Lowndesville.

8. *Cicindela hirticollis* Say.

Found on a sand bar in Congaree River and on the Ocean Beach.

June 10 to June 29 and Aug. 7 to Sept. Locally common on inland part of beach on Seabrook's Island, Charleston Co. Rare elsewhere.

4 localities: Columbia, Folly Beach, Myrtle Beach (G. E. Hudson, Henry K. Townes, Jr.), and Seabrook's Island.

9. *Cicindela traquebarica* Herbst.

Frequents sandy areas with sparse weedy vegetation; often found in dry stream beds.

Feb. 19 to July 1 and Sept. 16 to Nov. 14. Occurs throughout the state but is less common in coastal counties.

38 localities: Clemson College, Columbia, Easley (J. O. Pepper), Darlington, Prosperity, Rocky Bottom, Salem, Westminster, Walhalla, Jocassee, Fort Watson, Lexington Co., Old Pickens, Florence, Aiken, Richland, Hodges, Six Mile, Leesville, Antreville, McCormick, Lexington, Dents, Camden, Long Creek, River Falls (H. K. Townes, Jr.), Toddville, Green Pond, York (Louetta Youngblood), Greenville, Richland, St. Paul, Ware Shoals, Troy, Pinnacle Mtn., Newberry, Clover, and Duncan.

Three varieties of *Cicindela scutellaris* Say are recognized from South Carolina. In the present paper they are separated and defined as follows: *C. scutellaris* var. *rugifrons* Dej. largely green, sometimes with a bluish cast, well marked specimens with apical lunule and one or two marginal dots though South Carolina specimens usually with maculation reduced to traces of the apical lunule; *C. scutellaris* var. *carolina* E. D. Harris, as described by Mr. Harris, "with the usual green of the supra surface . . . more or less suffused with purple"; and *C. scutellaris* var. *unicolor* Dej. without trace of maculation and tending to blue rather than green. Some well colored specimens of *C. scutellaris carolina* E. D. H., duplicate Ridgeway's Dahlia Purple and are among the most beautiful tiger beetles known to the writer. *C. scutellaris* var. *unicolor* occurs in colonies, at times numerous, and is always without trace of maculation.

10. *C. scutellaris* var. *rugifrons* Dejean.

Taken on sandy areas covered with sparse weedy vegetation in Sand Hills and Upper Pine Belt of the State, roughly within the triangular area between Aiken, Chesterfield and Horry Counties.

Late February to June 20 and September 11 to early December. Active on warm days through the winter months. Locally common.

15 localities: Meredith, St. Paul, Columbia, Florence, Hartsville, Darlington Co., Camden (E. D. Harris), Chesterfield (J. O. Pepper), Landers Lake, Neeses (W. H. Rumff), Florence Co., McBee, Lexington, Pontiac (A. Lutken), and Dents.

11. *C. scutellaris* var. *carolina* E. D. Harris.

Habitat as of *rugifrons* Dej.

2 localities: St. Paul (Fort Watson), and Toddville (Pee Dee River, Horry Co.).

12. *C. scutellaris* var. *unicolor* Dejean.

Habitat as of *rugifrons*.

9 localities: Columbia, Lightwood Knot Creek (Lexington Co.), New Brookland, Windsor, Aiken (J. E. Webb), Cassett, Darlington, Pelion, and Orangeburg.

13. *Cicindela sexguttata* Fabricius.

Frequents bare ground and paths in or bordering woodland. Delights in sunning on logs and bare rocks along woodland streams.

March 18 to October 14. Common throughout the state, the specimens varying from deep blue to dull green and from the immaculate to eight spotted forms.

31 localities: Clemson College, Columbia, Easley (J. O. Pepper), Princeton, Honea Path, Pinnacle Mtn., Tomassee, Meredith, Walhalla (Tunnel), Jocassee, Table Rock, Salem, Rocky Bottom, Charleston, Pritchardville (E. S. Prevost), Pomaria, Fort Watson, Old Pickens, Florence, Fort Lawn, Kershaw Co., Orangeburg Co., Saluda Co., Fairfax (E. W. Howe), Russels, River Falls, Myrtle Beach (H. K. Townes, Jr.), Yauhannah, Green Pond, York (Louetta Youngblood), and Kershaw.

14. *Cicindela sexguttata* var. *harrisii* Leng.

Occurs only in the mountains. One specimen from Rocky Bottom, is of a peculiar olivaceous green, the characteristic color of this variety.

15. *Cicindela sexguttata* var. *violacea* Fabricius.

This variety is listed on the published distribution as given by Dr. Walther Horn in "Notes on the Races of *Omus californicus* and a List of the Cicindelidae of America North of Mexico." Trans. Amer. Ent. Soc. LVI., 1930, p. 83.

16. *Cicindela patruela* Dejean.

On paths and open ground above 2,000 ft. in mountains.

Apr. 13 to Oct. 12. Not common.

One locality: Sassafras Mtn. (Rocky Bottom, Pickens Co.).

17. *Cicindela punctulata* Olivier.

Dry upland fields, sparsely weedy areas, corn and cotton fields. Occasionally taken in trap lights and Japanese Beetle traps.

May 24 to Nov. 1. Very common throughout the state. 83 localities.

18. *Cicindela striga* LeConte.

The rarest known South Carolina tiger beetle, a single specimen taken in Hampton Park, Charleston, July 1, 1924, by J. T. Rogers. Specimen now in United States National Museum.

19. *Cicindela abdominalis* Fabricius.

Taken usually on white or gray sand in Pine Woods in the sand hills region of the state and in isolated localities usually near the coast. One notable exception recorded in a small colony found along a sandy path on top of a high ridge above Jocassee in upper Pickens County.

May 26 to Oct. 4. Not common.

15 localities: Meredith, Columbia, Bishopville, McBee, Camden, Wagner, Chesterfield Co., Jocassee, Florence Co., Myrtle Beach, Leesville, Bethune, Yemassee, McClellanville (J. T. Hills, H. K. Townes, Jr.), and Trenton.

20. *Cicindela rufiventris* Dejean.

Found on sloping bare ground on wooded hills between the fall line and mountains. June 17 to Sept. 25. Not common.

11 localities; Clemson College, Columbia, Pinnacle Mtn., Camden, Jocassee, Chesterfield Co., Lexington Co., Walhalla (Tunnel), Buffalo, Chester Co., and Leesville.

21. *Cicindela unipunctata* Fabricius.

A large weak-flying species occurring on the higher hills and mountains along paths and open spots in woods.

Apr. 13 to Sept. 25. Not uncommon.

9 localities: Clemson College, Pinnacle Mtn., Walhalla (Tunnel), Blythe Shoals, Rocky Bottom, Lake Lanier (G. E. Hudson), Jocassee, White Water Falls, and Greenville (H. K. Townes, Jr.).

22. *Cicindela trifasciata ascendens* LeConte.

Occurs on mud flats and margins of streams in those counties south and east of a line through Chesterfield and Aiken Counties. Apparently takes the place of *C. repanda* in the lower counties of the state.

April 2 to Sept. 22. Common.

27 localities: Meredith, Columbia, Yemassee, Hardeeville Sumter Co., Camden, Myrtle Beach, Florence Co., Kingstree, Monck's Corner, Folly Island, Summerton, Clarendon Co., Orangeburg Co., Dorchester Co., Grover, Hampton, Windsor, Nichols, Cherry Grove, Longs, Georgetown, Summerville, Lumber River, Gardens Corner, Pritchardville, and Elko.

23. *Cicindela dorsalis* Say (var. *media* LeConte).

Found only on the ocean beach.

May 19 to Sept. 1. Occasionally quite abundant.

10 localities: Folly Beach, Charleston, Pawley's Island, Beaufort, Myrtle Beach, Cherry Grove Beach, Isle of Palms, Cape Romain (J. T. Hills), McClellanville (H. K. Townes, Jr.), and Hilton Head Island.

24. *Cicindela marginata* Fabricius.

This species is the only *Cicindela* known to the writer to be active at night as well as in full daylight. At Porcher's Bluff, Charleston County, specimens were collected by flashlight along with *Tetracha carolina* and *T. virginica.* Use of a net was necessary in their capture since the beetles took wing readily, yet they seemed not to fly so quickly, were not so wary, as in daylight.

Occurs on the ocean beach and saline flats near the beach.

May 7 to Sept. 1. Not uncommon.

16 localities: Folly Beach, Yemassee, Charleston, Mt. Pleasant (G. E. Hudson), Beaufort, Myrtle Beach, Cherry Grove Beach, Longs, Isle of Palms, Georgetown, Cape Romain (J. T. Hills), McClellanville (H. K. Townes, Jr.), Bluffton, Hilton Head Island, Gardens Corner,and Seabrook's Island.

25. *Cicindela blanda* Dejean.

Taken only on sand bars or sandy margins of streams. At times this wary species swarms by hundreds along the Lumber and Waccamaw Rivers.

May 26 to Sept. 22. Locally common.

6 localities: Columbia, Florence Co. (Lynches River), Nichols, Lumber River (Near Nichols), Longs (Waccamaw River), and Mullins (F. B. Whittington).

26. *Cicindela togata* Laferté.

First called to our attention by Mr. J. W. Angell, of New York City who found it on the saline flats near the Toll Gate on the Folly Beach Road at Charleston. Two other localities, Gardens Corner, Beaufort County, and Porcher's Bluff, Charleston Co.

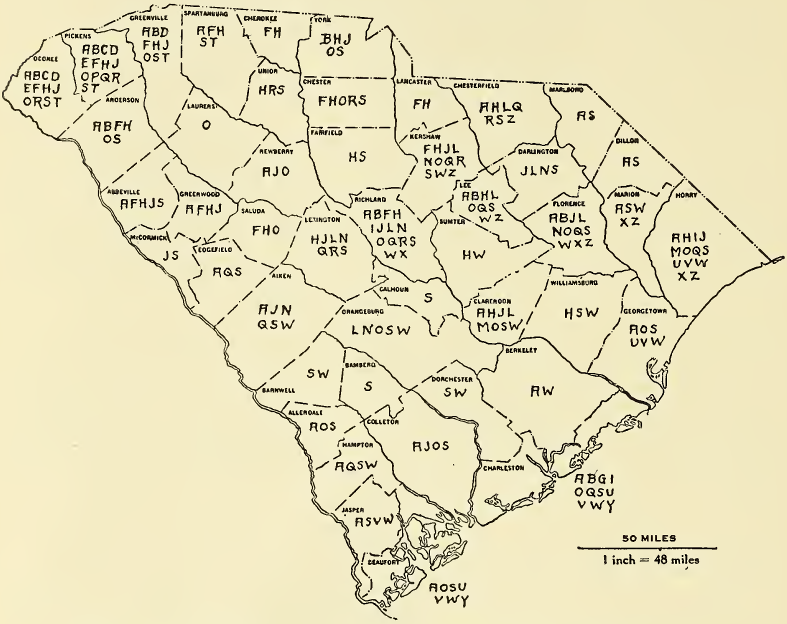
Not uncommon in these localities. May 7 to Aug. 31.

27. *Cicindela gratiosa* Guérin.

Occurs on glistening white sand remote from water. This species, though fairly common locally, is detected with difficulty since its coloration blends perfectly with its habitat.

May 30 to Sept. 11. Locally common.

7 localities: Bishopville, Meredith, McBee, Florence Co. (Florence Olanta Road), Myrtle Beach, Mullins, and Bethune.


OCONEE
ABCD EFHJ ORST
PICKENS
ABCD EFHJ OPQR ST
GREENVILLE
ABD FHJ OST
SPARTANBURG
AFH ST
CHEROKEE
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YORK
BHJ OS
ANDERSON
ABFH OS
LAURENS
O
UNION
HRS
CHESTER
FHORS
LANCASTER
FH
CHESTERFIELD
AHLQ RSZ
MARLBORO
AS
NEWBERRY
AJO
FAIRFIELD
HS
KERSHAW
FHJL NOQR SWZ
DARLINGTON
JLNS
DILLON
AS
ABBEVILLE
AFHJS
GREENWOOD
AFHJ
SALUDA
FHO
LEXINGTON
HJLN QRS
RICHLAND
ABFH IJLN OQRS WX
LEE
ABHL OQS WZ
SUMTER
HW
FLORENCE
ABJL NOQS WXZ
MARION
ASW XZ
HORRY
AHIJ MOQS UVW XZ
McCORMICK
JS
EDGEFIELD
AQS
AIKEN
AJN QSW
CALHOUN
S
ORANGEBURG
LNOSW
CLARENDON
AHJL MOSW
WILLIAMSBURG
HSW
GEORGETOWN
AOS UVW
BERKELEY
AW
BAMBERG
S
BARNWELL
SW
DORCHESTER
SW
ALLENDALE
AOS
COLLETON
AJOS
HAMPTON
AQSW
CHARLESTON
ABGI OQSU VWY
JASPER
ASVW
BEAUFORT
AOSU VWY
50 MILES
1 inch = 48 miles

FIG. I. DISTRIBUTION OF SOUTH CAROLINA TIGER BEETLES.

KEY

A—*T. carolina*
B— *virginica*
C— *melaena*
D—*C. purpurea*
E— *splendida*
F— *duodecimguttata*
G— *striga*
H— *repanda*
I— *hirticollis*
J— *tranquebarica*
L— *rugifrons*
M— *carolina*
N— *unicolor*

O— *sexguttata*
P— *patruela*
Q— *abdominalis*
R— *rufiventris*
S— *punctulata*
T— *unipunctata*
U— *dorsalis media*
V— *marginata*
W— *ascendens*
X— *blanda*
Y— *togata*
Z— *gratiosa*

TABLE I. *Seasonal Distribution of South Carolina Tiger Beetles.*

	JAN	FEB	MCH	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
T. carolina						UN	JUL	AUG	SEP	OC		
virginica						UN	xUL	AUG	xxP	O		
C. purpurea			CH	xPx	MAx	JxN		UG	xEx	xC		
splendida			CH	Axx	xA				P			
duodecimguttata			MxH	APR	MA			Ux	SEP			
repanda	N	xxx	xCH	APR	MAY	JUN	L	xUG	SEP	OCT		
hirticollis					Y	JUN		AxG	x?			
tranquebarica		EB	MxH	APR	MAY	Jxx	J	Axx	SEP	OCT	xO	
rugifrons			H	APR	xxY	JU			SEP	OCx	xO	
unicolor				P					EP	OCT	NOV	D
carolina			MxH	xxR								
sexguttata			CH	APR	MAY	xUN	JUL	AUx	SEP	xC		
patruela				Px	MAx	JxN			Ex	xC		
punctulata					Y	JUN	JUL	AUG	SEP	xCT	N	
striga							J					
abdominalis					Y	JUN	JUL	AUG	SEP	O		
rufiventris						UN	JxL	AUG	SEP			
unipunctata				PR	MAY	JxN	JUL	AUG	SxP			
ascendens				Axx	xAY	JUx	JUL	xUG	SEP			
dorsalis media					Ax	xUx	JUL	AUG	S			
marginata					MxY	xUN	JUL	AUG	S			
blanda					Y	JUx	xUL	AxG	xxP			
togata					Mxx	xUx	xxx	xUG				
gratiosa					Y	xxN	JxL	xUG	SE			

x Indicates ten-day period in which specimens were not collected yet during which the species was probably active.

Notes on Gargaphia tiliae.—At Onteora, in the Catskills, there is abundant *Tilia americana,* an ideal hunting-ground for *Gargaphia.* They appeared to be absent, however, until on July 27, 1932, I finally found one adult on a roadside tree and numerous second and third instar nymphs. Near Bushnellville, on August 1, I found a heavy infestation on a small tree; and here there were numerous last instar nymphs, just transformed adults and numerous cast skins. The leaves on which they were feeding were bleached in blotches from the gregarious habits of the nymphs, which feed on the underside of the leaves. This bleaching is not along the ribs, as is more usual with the other tingids. The species was common all through August at Onteora, but by early September they had disappeared, only one adult being found on September 17, where earlier they had swarmed.

Next year, numerous 2nd instar nymphs were found on July 9, with a couple of adults herding them. The following year (1934) on July 6 a group of nymphs in the 2nd instar was found with an adult on guard. This stood on the leaf near the group of nymphs, headed toward them. A couple of days later, some three or four herds of nymphs were noted, watched by an adult, in one instance by a pair *in cop.* By July 26, they appeared to be coming to the adult, and the recently transformed adults seem to be as gregarious as the nymphs at this time. By August 1st they were to be found in numbers—adults, last instar nymphs and younger. No further notes were made that summer.

A particular point was made to note the so-called parental solicitude of this gregarious species. Since no eggs were found guarded by adults after deposition, it is impossible to determine the parenthood of the watchers; nor was the sex noted, except in the case of the pair *in cop.* Likewise, no nymphs younger than 2nd instar were noted. Obviously, oviposition takes place some time about the middle of June and they hatch toward the end of the month, having the first molt early in July, naturally, according to the seasonal temperature.

To make sure that this *is* a case of parental solicitude, it will be necessary to find an adult female ovipositing and to follow the clutch of eggs to hatching and into the nymphal instars; and to note if it is the same individual female that stays with them.—J. R. DE LA TORRE-BUENO, Tucson, Arizona.

A NEW MELON GALL MIDGE.

By E. P. Felt, Stamford, Conn.

The species characterized below was reared by Dr. L. P. Wehrle, Assistant Entomologist, Agricultural Experiment Station, Tucson, Arizona, in 1932, in 1933, and again in 1934. He reports that the larvae cause the tips of watermelon vines growing in the vicinity of Tucson to curl and die. It is considered a serious insect enemy of watermelons in that section, the trouble having been noted by one grower nine years earlier. In addition to the cultivated watermelon, this species was also reared from the wild African watermelon, *Citrullus vulgaris* Schrad.

Itonida citrulli n. sp.

Male. Length 1.5 mm. Antennae a little longer than the body, sparsely haired, pale yellowish; 14 segments, the fifth with stems one and one-half and one and one-fourth times their diameters, respectively; basal enlargement subglobose, the distal enlargement broader apically and with a length one-fourth greater than its diameter; terminal segment produced, the basal enlargement subglobose, the basal portion of the stem with a length three times its diameter, the distal enlargement subcylindrical, with a length two and one-half times its diameter and apically a finger-like, sparsely haired appendage having a length nearly four times its diameter. Palpi, the first segment short, subquadrate, the second with a length three times its width, the third as long as the second, and the fourth one-half longer than the third. Mesonotum dark brown. Scutellum, postscutellum and abdomen fuscous yellowish. Halteres yellowish, light fuscous apically. Legs a fuscous yellowish, claws slender, curved, the pulvilli nearly equal. Genitalia, basal clasp segment moderately broad, stout; terminal clasp segment stout, slightly curved; dorsal plate broad, broadly and roundly emarginate, the lobes tapering to a narrowly rounded, sparsely setose apex; ventral plate short, deeply and roundly emarginate, the lobes slender, nearly parallel, sparsely setose apically; style long, tapering to a narrowly rounded apex.

Female. Length 1.75 mm. Antennae about three-fourths the length of the body, pale straw; 14 segments, sparsely haired, the fifth with a stem one-third the length of the cylindric basal enlargement, which latter has a length two and one-half times its diameter, terminal segment produced, the enlargement cylindrical, with a length three and one-half times its diameter, distally a finger-like process, somewhat dilated apically and with a length fully three times its diameter. Palpi, the first

> segment short, the second with a length three times its width, the third as long as the second, and the fourth one-half longer than the third. Mesonotum dark brown. Scutellum and postscutellum yellowish. Abdomen fuscous yellowish, the ovipositor with a length about three-fourths that of the body and apically with unusually slender lobes, they having a length about five times the width. Other characters practically as in the male.

This species runs, in the key to the genus, published in the 34th Report of the New York State Entomologist, State Museum Bulletin 231–232, on page 177 and following, to the series of species grouped with *I. agraria* Felt, from all of which it is easily separated by the shorter antennal stems in the male.

Types deposited in the collections of the U. S. National Museum. Paratypes in the collections of the author and Dr. L. P. Wehrle.

A Peculiar Mating Habit of the Silphidae.—Several years ago I kept specimens of *Silpha inaequalis* Fab. and *S. americana* Linn. in captivity, and observed the peculiar method by which mating occurs. The male insect climbs upon the back of the female and then grasps one of her antennae with his jaws. He maintains this hold throughout copulation. Sometimes a male beetle attempts to mate with one of his own sex. When this happens, the insect underneath buries his head in the earth so that the other cannot secure a hold on his antenna, and then rocks from side to side until the other is dislodged. Once I saw a male beetle mount another male already in copulation with a female beetle. The intruder was "dumped" upon his back unceremoniously. Beetles having the eyes covered with opaque varnish are not prevented from mating, although this temporary blindness renders them sluggish. Nor does the presence of such a vile substance as pyridine on the wing-covers of a female deter the male from his object. But remove the antennae of the female *Silpha,* and the male will go away without copulating after several vain efforts to grasp the antennae that are wanting.

Heymons and von Lengerken have observed this same behavior in the European *Silpha obscura* (Ztschr. wiss. Biol., Morph. u. Okol., Bd. 6., 1926).—Cyril E. Abbott, Morgan Park, Ill.

FOOD PLANT AND HABITS OF SEHIRUS CINCTUS P. B.

By J. R. de la Torre-Bueno, Tucson, Arizona.

Sehirus cinctus P. B. is one of the prettiest of our American Cydnidae, with its steel-blue back edged with clear white. It is far from rare, once its food plant is known and found. The first time I took this species in any numbers was at Lake Waccabuc, Westchester Co., N. Y., where it was found on a plant of the mint family. At Onteora, near Tannersville in the Catskill Mts., at an elevation of 2400 feet above sea-level, I was able to get a goodly number and to ascertain a food-plant of the species. The first in the locality (and the only one taken that summer) was a single specimen, an adult, on July 25, 1932. The following year, on July 4, I got one by sweeping, as usual; and on July 26 one was caught in flight and two more on a mint growing below my house porch. On the 28th, the mint (which Mr. Wm. T. Davis very kindly determined to be *Galeopsis tetrahit,* the hemp nettle) sported many of them running about on the upper surface of the leaves. The night before they had been seen at about dusk quiescent and one or two head down in the calyces from which the petals had dropped. One of the bugs placed on the palm of my hand proceeded to explore the perspiration-moist surface with its proboscis, but did not attempt to bite. These bugs were kept under observation from then on, and were constantly to be seen on the mint, in varying numbers and always adults, up to August 31. On that date, I saw two adults on the flagged walk in front of the house; and along the edges of the stones where the mints grew, there was an abundance of nymphs crawling about. These seem to be more or less gregarious, as two clumps of some 20 or more were seen, one on the edge of the stone and the other under growth of *Clematis.* These nymphs appeared to be in several stages, from II to IV or V—at least, the smallest were too large to be just emerged from the egg. On September 1 I again noted a couple of adults of *Sehirus* walking on the flag-stones and two clusters of numerous nymphs; one, under shrubbery, leaves and small stones, seemed to be made up mostly of 2nd and 3rd instar nymphs; the other, on the bare stone, had larger nymphs as well as the small indiscriminately. The day before, some of the nymphs were noticed head down in the calyces; as already noted, the adults also do this. Do they feed on the seeds? I also saw two or three of the nymphs dragging around seeds. By sunset, all had disappeared. On the

2nd the nymphs were again observed, but no adults were seen. At about 11 a. m. the nymphs were mostly under cover or on the ground, except for two or three on the walk. On the 3rd and 4th it was rainy, until 2 p. m. on the latter date, with a temperature of 70° F. at about 3 p. m. The *Sehiri* were naturally conspicuously absent in the rain, both on this day and the day before. Under the shrubbery in one small spot on the flagstones, a few young nymphs were noted in a clump, but by 3 o'clock there were three big clumps on the outer edges of the stones, made up of nymphs in several stages, from mature I up. Some of them had molted to the last nymphal instar. This, when mature, had the usual red abdomen marked with blue and steel-blue head, thorax and wing-pads. The just-transformed nymphs at this stage were light red in the abdomen, the blue parts a pale grey-blue. This applies to nymphs in other instars, except that the latter have no wing-pads. It should be noted that one of these clumps was gathered about what might have been a group of dead stems of the food-plant, just above earth level and single individuals were wandering about on the damp earth. A few of the nymphs were again noted head-down in the dry calyces of the plants. On September 9, the nymphs were in large numbers, as before, a few walking on the flags, but most of them congregated on dead leaves on the surface of the earth or under them on various stems. No first instar nymphs were noted. On the 10th, the nymphs were again observed. They were congregated in clumps at about 9 a. m., and a rough count seemed to indicate that there were some 1500 nymphs in the groups. They were rapidly transforming to the 5th instar, but there were still quite a few in other instars to be seen. At about 1 p. m., the bulk of them were massed on one of the flags, two and three deep in a pile. A black ant was seen running toward a small group of the nymphs, which it avoided, going around it. In fact, although there were plenty of these ants around, I never saw a *Sehirus* nymph attacked by one of them. I made no further observation till the 17th of September. The same *Sehiri* showed up after being hidden most of the preceding day, except for a few that wandered out between showers. There were the habitual big clumps of them, but more of the nymphs were in the last instar and a few had transformed to the adult. It was noticeable that the black ants running about on the pavement gave them a wide berth.

Last summer (1934) the observations could not be continued, as appears from my field notes, briefly sketched hereafter. A little sweeping on July 4 gave one individual at the same spot below the porch. On July 14, I saw five or six adults wandering about near and on the mint, and also on a stone slab under it, and sometimes on the ground, or else hidden under the side of a pebble. I also looked for eggs and nymphs, but saw none of either. The next day, the *Sehiri* were seen at the same place as the day before, but only one adult on a grass blade, where on the previous day there had been several. From the last mentioned date on, *Sehirus* was to be seen about, up to August 25, but adults only, no nymphs, where the year before they had been literally swarming, even though the hemp nettle was just as abundant as it had been the year before.

Anartia jatrophae L. in Texas.—On the 9th day of November in 1931, A. J. Boyles, Taxidermist to the Witte Museum of San Antonio, Texas, observed some fifteen or twenty white butterflies hovering over a water hole in the Edwards Escarpment, between sun-down and dark. The fact that they were butterflies and flying at this time of day and in a decided flock attracted his attention to such an extent that he collected three specimens. These proved to be one male and two females of *Anartia jatrophae,* the white peacock. At that time no other record could be found for the occurrence of this butterfly in the State. A very careful search has been made since that time for this insect but without success. On October 21, 1934, two individuals were taken near Sutherland Springs, Wilson County, Texas. These were feeding on *Verbesina encelioides* Benth. & Hook, and were discovered just about sundown. No other individuals were seen during the afternoon although the entire time was spent in hunting butterflies. On October 28, about ten miles from the former location, fifty of these beautiful black and white butterflies were captured on a small clump of the named plant. They consisted very larggely of spent females. A search throughout the surrounding neighborhood did not reveal another butterfly. The time of their greatest activity was in the late afternoon. On October 30 a single worn specimen was captured and no others were found after much searching. Of the specimens captured the condition ranged from newly emerged specimens to individuals who are almost devoid of scales. This leads to the belief that this butterfly is gregarious, that its native habitat must be in the deep shade of the forests in Mexico and southward and that the specimens captured in Texas wander or are driven in by Gulf storms.—H. B. Parks, San Antonio, Texas.

METHODS AND TECHNIQUE.

A Plea for Courtesy.

Several brief articles have been noted recently in which the writers have given new names to species bearing pre-occupied names. Apparently not one of these writers communicated with the author of the species, pointing out the error, and giving the describer an opportunity to make the correction himself. Such a procedure would be only common courtesy. This point is, in fact, covered in the Code of Ethics under Article 34 of the International Rules of Zoological Nomenclature, but far too few workers adhere to the ruling. If the original describer made the correction it would make for less confusion in subsequent check lists and citations. Again, it would be the courteous thing for the original describer, in making his correction, to mention the name of the one who called attention to the error.

In another instance a systematic worker had two species, one of Le Conte's and one new. He mistook the new species for Le Conte's and described Le Conte's species as new with a specific key to the genus. The error was kindly called to his attention by another worker and the first worker immediately published a new description and key, making the necessary correction, but no mention was made of the one who called attention to the error; again, a failure to observe a common courtesy.

Surely common sense should overcome the desire to be author of a nomen mutatum; should overcome the reluctance to admit an error through a false sense of infallibility.—Geo. R. Hopping, Vernon, B. C.

On Mounting Leafhoppers.

The writer once mounted up and sent to a specialist some bees that a botanical friend had collected in a pollination study. The large bees were pinned but the smaller ones had dried out, until they were brittle and so were mounted on card points. What that specialist wrote about imbeciles, idiots and other amateur enomologists was illuminating, if not comforting. He concluded his letter with this well remembered statement, "The way to mount an insect is to stick a pin through it—the bigger the pin the better."

The writer always intended to get together an assorted set of finishing nails and bridge spikes and send that specialist a properly mounted collection, but there were too many leafhoppers awaiting study and alas, too many of these leafhoppers had been mounted by bee specialists and presented little but a verdigris impregnated fringe around a "bigger and better" pin or perhaps they had been glued in the middle of a cardboard paving block. If they had escaped both these fates it was only to fall into the hands of a coleopterist who would gleefully bend down the end of a card point and daub one whole side of the little leafhopper with glue, thus committing in one single stroke the two worst atrocities of leafhopper mounting—hiding the wing venation and attaching by a fragile wing, easily broken off.

But how do you mount a leafhopper? Simple—the legs, the sternum and the venter furnish no diagnostic characters—while on the other hand, they do furnish a relatively broad flat point of attachment which when properly glued to a card point insures permanency without obscuring any valuable structure.

The best card points are cut by hand from heavy linen ledger paper. The paper is cut into strips 9 mm. wide. A heavy razor kept moderately sharp will cut through 6 or 8 strips at a time, and can be varied to form extremely fine points for small species and broader ones for the larger specimens. All points should be tapering, broad enough at the base to firmly hold on a No. 2 pin and fine enough at the point not to overlap either the face or the genital structures. The point should be pushed up on the pin so that a specimen can be studied by a low power compound microscope or a hand lens without touching the pin head.

The leafhopper should be placed on its back with its head away from the operator, the tip of the card point touched with glue (or shellac) and pressed firmly into the middle of the under side and then righted. The leafhopper will then be right side up on the end of the point with its head forward and all its diagnostic characters visible. In this day of high cost of pins and labor the writer often uses 10 mm. card points and after mounting one leafhopper on the end as before places three small drops of glue along the point and with a flat forceps adds three other specimens. One of these may be mounted bottom up to show face and genitalia if desired. Usually two males are mounted near the end and two females (or one and a nymph) nearer the pin. The sexes are thus associated and several individuals can be compared at once.—E. D. Ball, Tucson, Arizona.

EDITORIAL.

ON NEW TERMINOLOGIES.

In the natural course of editorial events one meets with all sorts of terminologies in descriptive entomology, covering many and diverse groups of insects.

In the first rank we have old and established terminologies, such as those invented by the great masters of old for the larger groups; these are, in the main, still in use.

Next, we come to the neologisms invented by intense workers in minor groups, to meet their own peculiar problems—problems all of us confront when we meet with the highly specialized structures which demand some new word to depict a positive and heretofore undeveloped fact.

Superadded to these are the ever-changing wing-venation schemes (we do not here impinge on their soundness), which appear to evoke new names for old things.

And we come now to morphologists in the large who make up practically infinite series of neologisms to cover old and well-known structures for which satisfactory names have long been in current and accepted usage.

And the final gilded dome to this unwieldy structure, is crowning touch, is the far-too-many who flower in inadequate knowledge, who garble, misuse, mangle, and even misspell terms!

We do not touch upon the many other lesions inflicted on terminology by abbreviations, by pseudo-mathematical formulae, and by other evidences of erudition *in absentia,* put forth as labor-savers (probably for some unappreciative typist).

Now, the time is come to take stock, before all of us are engulfed in a bottomless quicksand of these many shifts. For a very large proportion of these terms there is no adequate reason. Why should there be a universal "uwantakandy" telescoping of names? Why should there be universal recastings of terminologies? There are two answers to both questions: Basic ignorance; or despair at the undigested (and indigestible) conglomerate.

There is, of course, a reasonable solution to the problem—namely, adequate knowledge thoroughly assimilated. We can attain some of this by reading and pondering the basic definitions of Kirby and Spence; and in Shuckard's translation into English of the first volume of Burmeister's German work. With these as a foundation, and with the aid of a good dictionary of entomology, it should be possible to avoid so much arduous and unnecessary labor.

But the final stabilization and correctness will never be reached until there are hard-and-fast *accurate* definitions of all entomological terms; and a universal agreement on usage.

"Quoth the raven, 'Nevermore.' "

J. R. T.-B.

A DESERVED RECOGNITION.

Science for February 15, 1935, carries the following item: Dr. L. O. Howard, formerly chief entomologist in charge of the Bureau of Entomology, U. S. Department of Agriculture, writes: "Government officials of Denmark paid last autumn a very good and well-deserved compliment to the work done in the United States in a certain branch of science. They invited Dr. Adam G. Böving, who for twenty-two years has been working in the U. S. National Museum and in the Bureau of Entomology of the Department of Agriculture, to cross the Atlantic and to give two short courses of lectures in Denmark. One of these courses, given at the Royal Museum of Zoology, of the University of Copenhagen, related to the classification of the larvae of the Coleoptera. This is a subject that in the last century was studied by the famous Danish workers, Schiödte and Meinert. Böving worked with Meinert and, fortunately for us, fate brought him to the United States and to Washington, a generation ago. These lectures were well attended by Danish students and workers and by some men from adjoining countries. The book by Böving and Craighead published in 1931, entitled 'Illustrated Synopsis of Larval Forms of Coleoptera' and which has been termed 'epoch-making' by certain Europeans, incited this course. The second course was delivered before the Royal Veterinary and Agricultural College and aroused much interest. The agricultural journals and the daily press paid much attention to these lectures. They related to applied entomology in the United States and especially described our organization and methods of work. Both courses were given in September."

The work mentioned was published in ENTOMOLOGICA AMERICANA, vol. XI, taking up the entire volume, with its 125 plates and explanation of them, and the illuminating text.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. 5 sizes type. 3½ point, 75c per 1000. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

WILL COLLECT for cash all ORDERS OF INSECTS, providing I receive sufficient orders prior to collecting to justify my proceeding. Have many specimens in stock at all times for sale. Louise Knobel, Hope, Arkansas.

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BULLETIN

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NOTES ON SYSTENA.

By Doris H. Blake, Washington, D. C.

This paper presents the results of a study of two groups of vittate species of *Systena,* (1) the more or less closely allied species that have gone under the name of *Systena taeniata* (Say) since Horn's revision of the genus in 1889, and (2) the very closely related species belonging to a widespread group of which *S. elongata* (Fabr.) is a well-known representative in the United States. Drawings are given of the Le Conte and Melsheimer types of the species concerned and of a cotype of Boheman's *S. pallidula.* In addition, descriptions are included of three new species based on material hitherto referred to *S. taeniata* in the National Museum and other collections, and of a new Central American species which is closely related. Except for a small collection of *Systena* from the Illinois State Natural History Survey and a few specimens, chiefly types, from the Museum of Comparative Zoology, this study is of specimens in the National Museum. My thanks are due the authorities in charge of these collections for the opportunity to study this material.

Group I.

Systena taeniata (Say).

Altica taeniata Say, Long's Second Expedition, p. 294, 1824.

Systena taeniata Horn, Trans. Amer. Ent. Soc., vol. 16, pp. 272, 318, 1889.

Say described *Altica taeniata* as "black; antennae, feet, and vitta on the elytra, white. Inhabits North-west Territory. Body deep black, polished; head with rather distant, profound punctures; region of the antennae a little elevated and dull rufous; antennae pale, dusky at base and tip; thorax punctured; punctures rather large and profound, but not very dense; no impressed line; posterior angles with minute abrupt excurvature, acute; elytra punctured

JUL 5 1935

like thorax, with a longitudinal white vitta on the middle of each, commencing at the middle of the base and extending rectilinearly, with a slight degree of attenuation to near the tip and occupying about the sixth part of the surface; feet pale, posterior thighs dusky towards the tip. Length three-twentieths of an inch. This species resembles *A. striolata* Schöenh. (which seems to be *Crioceris vittata* and *Galleruca elongata* of Fabr. . . .) but it is larger, of a more elongated form, and the vitta of the elytra is not flexuous as in that common and profusely named insect. I have not met with it in the Atlantic States."

The type of Say's species, unfortunately, is lost. Horn, who first placed *taeniata*[1] in the genus *Systena*, stated that he did so on account of Say's description of the thorax as having "prominent or excurved hind angles" and because of "his mention of *G. elongata* in the description."[2] In his table of species (p. 318), Horn synonymized with *taeniata* Le Conte's species *ligata, ochracea, mitis,* and *bitaeniata,* and Melsheimer's species *blanda,* the types of all of which are in existence in the Museum of Comparative Zoology at Cambridge, Mass., and also *S. pallidula* Boh., which is in the Stockholm Museum. In his discussion of *taeniata,* Horn recognized as intergrading varieties Le Conte's species *ligata, ochracea,* and *mitis,* and Melsheimer's *blanda,* but he did not discuss at all the species *bitaeniata* or *pallidula.* The types of all of these except *pallidula* have been examined, and not one of them agrees in every respect with Say's description of *taeniata.* In fact, the writer has been unable to find a species of *Systena* that does entirely fit *A. taeniata* as described by Say. Since Say's type of *taeniata* is no longer in existence, and since his description cannot be applied with certainty to any one of the four species here distinguished in the material that has hitherto been called *taeniata,* it seems necessary to drop the name for any one of these species.

Systena blanda Melsheimer. (Figs. 1 and 2.)

Systena blanda Melsheimer, Proc. Acad. Nat. Sci. Phila., vol. 3, p. 164, 1847.

Systena taeniata var. *blanda* Horn, Trans. Amer. Ent. Soc., vol. 16, pp. 273, 318, 1889.

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[1] In Gemminger and Harold's Catalogus Coleopterorum, vol. 12, p. 3516, 1876, it is given as a synonym of *Phyllotreta vittata* Fabr.

[2] Le Conte, Coleoptera of Kansas and Eastern New Mexico, p. 26, 1859; regarded *taeniata* as synonymous with *H. elongata* Fabr., which he placed in the "division *Systena*" of *Haltica.*

Melsheimer described *Systena blanda* as testaceous, with the antennae and body beneath black, the elytra with reddish brown subsutural vitta and lateral margins. The habitat was given as Pennsylvania.

In the Melsheimer collection at the Museum of Comparative Zoology at Cambridge are 10 specimens, following a series labeled "*blanda* Melsh. Pa. Ziegler," that are labeled "Pennsylvania, Melsheimer."[3] These are all one species, although there is a slight variation in coloring. The punctation of the head is not dense but scattered and fine, the surface is very shining and pale reddish brown, the lower front paler yellow, and the labrum dark. The outer joints of the antennae are deep brown or piceous. The antennae do not extend to the middle of the elytra; the third joint is shorter than the fourth or fifth, which are subequal, the remaining joints slightly shorter. The prothorax has rounded sides and is slightly wider before the middle and contracted before the base. There is a faint depression on each side near the base; the surface is shining, finely and not densely punctate, and pale yellow with the lateral margin and often a little of the side brown or piceous. The scutellum is usually brownish. The elytra are shining pale yellow, more densely and regularly punctate than the prothorax, but not coarsely or deeply so. There is a reddish brown common sutural vitta uniting at the apex with a lateral marginal one, these vittae frequently being not much darker than the pale yellow of the elytra. The edge of the lateral margin is often deep piceous as far as the apical curve. The epipleura, prosternum, and legs are pale, but the metasternum and abdomen vary from reddish brown to piceous.

This is the only pale vittate *Systena* found east of the Mississippi River. The only other eastern vittate species, commonly known as *S. elongata* Fabr., is black with a yellowish white median elytral vitta.

Systena blanda is also found west of the Mississippi River. Specimens from Iowa, Missouri, and Kansas do not differ from specimens from New York to Georgia. In the Rocky Mountains, however, the species takes on a darker coloring. For instance, of 4 specimens from Burley, Idaho, the head in 2 is deep brown, the prothorax in 3 is irregularly darkened, the elytral vittae in all are piceous, and the epipleura, undersurface, and legs tend to be piceous. A similar deepening in coloration is found in specimens from Utah, Colorado, New Mexico, and Texas (Bosque Co.). Since other species of *Systena* closely resembling both the eastern pale form and the darker western form of *blanda* are found west of the Mississippi, the only certain method of identifying *blanda* from those regions is by examining the aedeagus.

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[3] Hagen, H. A. (Can. Ent., vol. 16, p. 196, 1884) states that he "put on every pin a small printed label 'Melsheimer' to record the former proprietor."

Systena blanda belongs to a group represented north of the Mexican border by *blanda, blanda* subspecies *ligata,* and *mitis.* They are rather broadly oblong species, mostly pale, with distinctly punctate and vittate elytra and a less densely punctate prothorax, the lateral edges of both prothorax and elytra usually being dark. The antennae do not extend to the middle of the elytra, the prothorax is scarcely more than a third wider than long, with a basal impression at the sides, and the aedeagus is distinctive in having a lateral notch on each side near the apex. This peculiar notch occurs in one other group of species, to which *S. elongata* belongs, but the apex of the aedeagus in that group is not acute but broad.

None of the species of the *blanda* group exactly fits Say's description of *A. taeniata.* They all differ by having dense elytral punctation and less dense pronotal punctation, and all, except infrequent very dark forms of the California subspecies *ligata,* are pale as contrasted with the "deep black" of *taeniata.*

This species has been collected on the following plants: bean (Marshall Hall, Md.); corn (Columbia City, Ind.); cucumber (Madison, Wis.; Plymouth, Ind.); cotton (Atlanta, Ga.; Red Springs, N. C.); *Perilla* foliage (Madison, Wis.); pursley (Muscatine, Iowa); sugar beets (Bowling Green, Ohio; Fort Collins, Greeley, Rocky Ford, Colo.; Wellsville, Mendon, Utah; Burley, Idaho); *Salsola pestifer* (Taos, N. M.); turnip (Knox, Ind.); wheat (Cuckoo, Va.).

Specimens have been examined from: New York (Ithaca); New Jersey (Riverton, Troy Hills); Pennsylvania (Cove Mt., Frankford, Glen Olden, Lehigh Gap, Philadelphia, Terre Hill); Maryland (Beltsville, College Park, Glen Echo, Marshall Hall, Mt. Holly); Washington, D. C.; Virginia (Arlington, Cuckoo, Glencarlyn, Grassymead, Pennington Gap, Richmond, Smithfield); West Virginia (White Sulphur); North Carolina (Greensboro, Mitchell Co., Red Springs); South Carolina (Dean); Georgia (Atlanta); Mississippi (Jackson); Ohio (Belmore, Bowling Green); Kentucky; Indiana (Columbia City, Knox, Plymouth, Marion); Illinois (Algonquin, Antioch, Aurora, Carbondale, Dubois, Grand Tower, Marshall, Oakwood, Pulaski, Salts); Wisconsin (Madison); Iowa (Muscatine); Kansas (Mackenzie, Riley Co., Rooks Co., Topeka); Missouri; Texas (Bosque Co.); New Mexico (Barton, Estancia, Maxwell, Taos); Utah (Mendon, Wellsville); Colorado (Colorado Springs, Denver, Fort Collins, Greeley, Pueblo, Rocky Ford); Idaho (Burley); Alberta (Medicine Hat).

Two specimens in the Bowditch collection from Surinam labeled in Jacoby's handwriting "*marginicollis* Cl." and "compared with type," both females, are indistinguishable from *blanda*.

Systena blanda subspecies *ligata* (Lec.). (Figs. 3 and 4.)
Haltica ligata Le Conte, Pacific Rail. Rept., p. 68, 1857.
Haltica ochracea Le Conte, Proc. Acad. Nat. Sci. Phila. (vol. 10), p. 87, 1858.
Systena taeniata var. *ligata* and var. *ochracea* Horn, Trans. Amer. Ent. Soc., vol. 16, pp. 273, 318, 1889.

Le Conte described *H. ligata* from one specimen, a female, collected at San José, Calif., which bears the Museum of Comparative Zoology Type No. 4458 and the label "*S. ligata* Lec., S. José." This specimen has a dark piceous, shining head, somewhat paler along the middle of the lower front, about the antennal bases, and around the eyes; the tubercles are well defined; the occiput and vertex have several coarse and numerous finer punctures and a fairly smooth impunctate area in the middle. Both antennae are missing. The prothorax is slightly wider before the middle and contracted near the base, with a slight depression on each side near the base, and is shining piceous with irregular paler reddish brown areas; the surface is not densely or coarsely punctate, but there are a few coarser punctures behind the middle. The elytra are shining and more regularly and densely but not very coarsely punctate. The sutural and lateral-marginal vittae are piceous and unite at the apex, the paler intervening vitta being clouded at the base with brown. The undersurface is dark, shining, and with scanty pubescence; one anterior and two middle femora and two posterior legs are present, the anterior and middle femora and posterior tibiae being paler and the posterior femora dark.

Haltica ochracea was described from a single specimen from San Diego, Calif., which bears the label "*H. ochracea* Lec., S. D." and the Museum of Comparative Zoology Type No. 4460. It is a somewhat misshapen specimen, possibly immature or twisted from being in alcohol, with the abdomen so shrivelled that the sex is not easily determinable. The prothorax, too, is not contracted near the base, as in typical specimens of *Systena* (probably deformed), the sides being widest at the base and narrowed anteriorly in nearly a straight line. The head is shining and deeper yellow than the prothorax, with a brown labrum and tubercles, and on each side of the vertex are 6 or 7 coarse punctures. The antennal joints are of the same proportions as in *S. blanda,* with the first four basal joints paler than the outer ones. The prothorax is pale yellow, with the anterior lateral margin slightly edged with deeper brown, shining, rather irregularly punctate with a group of coarser punctures near the base, and with a short basal impression on each side. The elytra are shining pale yellow with barely visible traces of a sutural and a lateral marginal vitta joined at the apex; the punctation is somewhat obsolete but dense. The metasternum and the abdomen are dark brown and the legs pale.

At first glance the very pale, somewhat distorted specimen from San Diego, with scarcely any sign of vittae, does not resemble the dark vittate specimen from San José, but a close comparison shows the two to be very similar in structure, and other specimens are found that present intergradations in color. A series of specimens from Sacramento, Calif., shows a wide color range from specimens even darker than typical *ligata* to some nearly as pale as typical *ochracea.* In several there are only traces of the pale elytral vittae, and one specimen from Chico has entirely dark elytra. Other specimens fully as pale as the type of *ochracea* occur in a large series from Huntington Beach, Calif., a series in which there are also dark specimens.

This Pacific coast *Systena* so closely resembles *Systena blanda* that it is unlikely that it is more than a subspecies of *blanda.* The aedeagus of the western specimens is very similar, the tip being only a little more pointed. Again the Pacific coast specimens are slightly larger and usually more deeply and coarsely punctate, the prothorax being usually but not always more densely punctate, and the coloring is often more variable in a single series from one locality than is found in the more eastern specimens from such widely separated points as Pennsylvania and Colorado. Differences of this sort occur in numerous species of Chrysomelidae that on the Pacific coast appear to take on a different habitus from their very close eastern relatives.

Specimens of this subspecies have been examined from the following California localities: Chico, Chino, Davis, Guerneville, Hamilton City, Huntington Beach, Irrigosa, Justin, Lindsay, Los Angeles, Oxnard, Pasadena, Pomona, Sacramento, Salton, San Bernardino, San Mateo, Santa Ana, Santa Clara, Spreckels, Van Nuys, Whittier.

It has been collected on sugar beet (Huntington Beach, Pasadena, Oxnard, Hamilton City, Spreckels, Chico, Chino); potato (Whittier); *Helianthus* sp. (Chino, Lindsay, Van Nuys); mustard (Santa Ana); radish (Guerneville); and alfalfa (Sacramento).

Systena mitis (Lec.). (Figs. 6 and 7).

Haltica mitis Le Conte, Proc. Acad. Nat. Sci. Phila. (vol. 10), p. 87, 1858.

Systena taeniata var. *mitis* Horn, Trans. Amer. Ent. Soc., vol. 16, pp. 273, 318, 1889.

The specimen bearing the label "*H. mitis* Lec. Col." in the Le Conte collection, which also has the gilt label indicating the locality California and the Museum of Comparative Zoology Type No. 4459, is a somewhat immature specimen with the elytra a little curled under at the apex, the coloring not fully developed, and the abdomen so twisted that the sex is not determinable from that. This specimen may be regarded as the type, since the label "Col." evidently refers to Colorado River, Calif., the type locality. Following it is a second of the same species, also with a gilt label; a third, probably the same species, with no label; a fourth, not the same species, labeled "Cal.," with signs such as Crotch used; and a fifth, probably the same, with no label. It is unlikely that Le Conte had before him more than the first two specimens at most when describing *mitis,* since the rest do not bear labels corresponding to his type locality, and do not all agree with his description. In the type specimen, the head is reddish brown, a little paler on the lower front and on the extreme occiput, with a dark labrum, and with numerous coarse punctures on each side of the vertex. The antennae are entirely reddish brown and the third, fourth and fifth joints are about the same length. The prothorax is widest a little before the middle, the sides are rounded, and there is an indistinct transverse basal impression more apparent on the sides; the surface is very shiny with scattered coarse punctures, and paler yellow than the head, the lateral margins and a little of the sides being darker or piceous. The elytra are rather shallowly, not very coarsely and rather densely punctate, and have a reddish brown sutural and lateral marginal vitta united at the apex, with the apex a little paler. Beneath, the sides of the prosternum, mesosternum, and metasternum are dark, and the abdomen and legs pale.

As Le Conte states, *mitis* resembles *blanda* very closely. In general, it is larger and more slender than *blanda,* with a more coarsely punctate head, the antennal joints are entirely reddish brown instead of having darker outer joints, and the abdomen is usually pale, which is not true of *blanda.* The only certain method of distinguishing *mitis,* however, is by the aedeagus, which has a longer, more tapering tip than that of *blanda.* The aedeagi of two males in a series from Amarillo, in northwestern Texas, appear to be intermediate in shape between those of *blanda* and *mitis*. From the standpoint of comparison of aedeagi, *blanda* and *blanda* subspecies *ligata* are more closely related to each other than either is to *mitis*, but all three are very similar in external appearance and by some will doubtless be regarded as merely geographic races of one somewhat variable widespread species.

Specimens of *mitis* have been collected at Yuma, Ariz., on alfalfa and at Amarillo, Tex., on sugar beet.

This species is represented in the National Museum collection from California (El Centro, Holtville, Salton); Arizona (Ft. Yuma); New Mexico (Las Vegas); Colorado (Rocky Ford); Texas (Amarillo).

Systena mesochlora, n. sp.
(Fig. 8.)

Elongate-oblong, about 3.5 mm. long, shining, with very finely and sparsely punctate head and prothorax, and densely and distinctly punctate elytra; pale yellow or greenish yellow, the mouth parts, and usually the lateral margin of prothorax, and in dark specimens, the sutural and lateral-dorsal vitta, dark brown; in paler specimens only traces of elytral vittae; sides of prosternum, metasternum, and abdomen more or less dark.

Head smooth, shining, very finely and sparsely punctate; deeper yellow over occiput; mouth parts dark; frontal tubercles distinctly marked. Antennae long, slender, pale yellow, extending to middle of elytra, third joint usually a little shorter than fourth or fifth, which are subequal. Prothorax with rounded sides, wider before the middle, about a third wider than long, depressed more or less distinctly across base; surface shining, finely punctate; pale yellow or greenish yellow, with lateral margin and the lateral sides usually narrowly touched with brown. Scutellum rounded at base, yellow or brown. Elytra oblong with small humeral prominences, shining, densely and distinctly punctate; pale yellow or greenish yellow, in pale specimens frequently with little trace of vittae, in darker specimens with dark sutural and lateral-dorsal vittae, not joined at apex, sutural vitta not reaching apex and lateral vitta not near margin. Body beneath shining, lightly pubescent, sides of prosternum, metasternum, and often abdomen in part dark. Legs pale, frequently with outer edge of tibiae and apex of hind femora dark. Length 3.5 to 3.8 mm., width 1.5 to 1.6 mm.

Type male and 5 paratypes (3 males and 2 females) U. S. N. M. Cat. No. 50116, collected at San José, Costa Rica, by J. F. Tristán, in April, 1928.

Other locality.—San Isidro, Costa Rica.

This species has the usual rather broadly oblong shape, pale coloring, sparsely and finely punctate head and prothorax, and more densely punctate elytra characteristic of the *blanda* group. Likewise, the under surface is more or less dark. The aedeagus resembles those of the group in being pointed and having a lateral notching on the sides near the apex, but differs in minor details shown by the illustration. *S. mesochlora* is further distinguished by the elytral markings, which differ in that the vittae do not join at the apex, the lateral one is not near the margin, and the sutural one does not reach the apex. It is possible that the living beetles are distinctly green instead of yellow, as there is a greenish hue to some of the dried specimens.

Systena bitaeniata (Lec.). (Fig. 10.)

Haltica bitaeniata Le Conte, Coleoptera of Kansas and Eastern New Mexico, p. 26, 1859.

Systena bitaeniata Horn, Trans. Amer. Ent. Soc., vol. 16, p. 318, 1889.

Le Conte described *H. bitaeniata* as elongate, piceous black, and above very shining (pernitida) with the head posteriorly paler, the thorax fuscous testaceous with three obscure spots, sparsely punctulate, with a light transverse basal impression, foveate in the middle; the elytra dark, punctate, with a wide pale dorsal and a marginal vitta, these vittae often uniting near the apex; the antennae and legs fuscous, the posterior femora obscure. The habitat is given as Santa Fé, N. Mex.

There is no specimen labeled *bitaeniata* in the Le Conte collection of *Systena,* but there are 3 unnamed specimens (1 male and 2 females) with a green-circle label, which indicates the Southwestern States, that correspond with Le Conte's description. The head is shining, with fine, not dense punctation, becoming a little coarser near the distinctly marked frontal tubercles. The color is somewhat variable, being brownish with a dark labrum and an indefinite dark area over the tubercles, a paler area across the vertex, and a dark spot behind the eye and in the middle of the occiput. The antennae are reddish brown, slender, not extending to the middle of the elytra, the fourth joint longer than the third. The prothorax is shining, rather sparsely and finely punctate, distinctly impressed across the base in the male and less so, with a median basal fovea, in the 2 females. The sides are rounded and wider before the middle. The prothorax is paler than the head, marked by three indefinite darker areas consisting of a median streak widened anteriorly and two lateral dark spots; in one of the females these spots and the median dark streak coalesce. The elytra are shining, not densely or coarsely punctate, with a dark sutural and lateral vitta not reaching the apex, the apex, margin and epipleura and median vitta on each elytron being pale. Beneath, the body is dark, the prosternum paler at the margin, and the legs yellowish brown except the darker hind femora. The male is about 4.5 mm. and the females 5 mm. long.

This dark vittate species is quite distinct from *blanda, blanda* subspecies *ligata,* or *mitis.* It is more highly polished, more lightly and not very densely punctate, with slightly longer and more slender antennae, with a differently shaped and wider prothorax, which is more or less darkly clouded, and with the edge of the elytral margin frequently and the epipleura nearly always pale. The aedeagus is entirely different from those of the *blanda* group. This species differs from Say's description of *Altica taeniata* in having finer punctation and a paler prothorax, and usually in having a pale elytral margin as well as pale epipleura.

There is considerable variation in the coloring of this species. Dark specimens occur in which the head is nearly all black, the prothorax dark except for a pale streak along the basal margin, and the elytra have only a narrow pale median vitta on each elytron. Even in the darkest specimens, however, the epipleura are nearly always pale. The palest specimens have a reddish brown head and prothorax in which there may be little trace of darker areas, and the elytra have a wide median pale vitta, which is joined at the apex to a narrower marginal pale vitta. The punctation, too, is often more distinct in some specimens than in others, but it is never coarse.

S. bitaeniata has been collected on "bracted bindweed" (*Convolvulus* sp.) in Alberta (F. S. Carr), and swept from locoweed in Arizona (E. E. Russell).

Specimens have been examined from Arizona (Ashfork, Flagstaff, Palmerly, Cochise Co., Petrified Forest, Prescott); Utah (City Creek Canyon, Ft. Douglas, Marysvale, Provo, Wasatch, Wellsville); Nevada; New Mexico (Las Vegas); Colorado (La Plata Co., Lookout Mt., Jefferson Co.); "Dakota"; Alberta (Medicine Hat); California (Bridgeport).

Systena pallidula Boh. (Fig. 5.)

Systena pallidula Boheman, Eugenies Resa, p. 192, 1858–9.

The habitat of *Systena pallidula* as given by Boheman is "St. Fransisco," Calif., and Insula Puna (an island off the coast of

Ecuador). Horn,[4] with no discussion of the species, placed it under *S. taeniata* in his synonymy, and there it has remained ever since. A. Roman, of the Natural History Museum at Stockholm, in correspondence with the author, states that there are 10 specimens in the type material of *S. pallidula,* and has sent one as a gift to the National Museum. Mr. Roman has compared specimens sent him of all the pale species known from California, and writes that *S. pallidula* is different from any of them, and that the species may be a South American one, since "mistakes in labeling have not been rare in the 'Eugenia' material." He writes that the collection of *S. pallidula* consists of 6 specimens from "California" and 3 from Puna, but these are possibly a different species. The name *pallidula* was originally given by F. Sahlberg to one of his species from South Brazil, "of which we have one specimen, but this species being undescribed, Boheman took the name for his own species."

The cotype sent, a female, differs from any of the species from western North America examined by the writer by having a narrower head with narrower interocular space, and by having the elytra considerably wider than the prothorax. In coloring, too, the whole insect is pale, the head being a trifle deeper yellow over the occiput, and the elytra differ from those of the western species by lacking any trace of vittation. The frontal tubercles are rather indistinctly marked and the punctation of the head is extremely fine and sparse. The antennae are slender and more than half the length of the body, with the third joint a little shorter than the fourth, fifth or sixth, which are long and subequal. The prothorax is not quite twice as wide as long and wider before the middle, with a distinct basal impression, and is finely and densely punctate. The elytra have feeble humeral prominences, are considerably wider than the prothorax, and finely and moderately densely punctate.

A single specimen, also a female, in the National Museum collection, from Corozal, Canal Zone, Panamá, is very similar to the cotype of *pallidula* and probably represents the same species. Since the Frigate Eugenia stopped for 2 weeks in the Bay of Panamá and at the Island of San José (one of the Perlas Islands near Panamá), it seems reasonable to suppose that the type locality of *S. pallidula* (as represented by the specimen sent) may be Panamá rather than either Puna Island, off the coast of Ecuador, or San Francisco, Calif.

The description of *A. taeniata,* a polished black beetle with a single white vitta on each elytron, does not fit either in regard to color or sculpture this pale, very finely punctured species.

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[4] Horn, Trans. Amer. Ent. Soc., vol. 16, p. 318, 1889.

Systena laevis, n. sp. (Fig. 9).

Elongate-oblong, slender, about 3.5 mm. long, shining, very finely and indistinctly punctate, pale yellow with slightly deeper yellow head and antennae and sometimes a reddish-brown narrow sutural vitta not reaching apex, rarely a trace of a lateral vitta; elytra especially in male not much wider than prothorax.

Head smoothly rounded over occiput and very finely punctate, deep yellow with lower front paler and mouth parts often edged with brown; frontal tubercles rather indistinctly marked. Antennae about half length of body, pale, third joint usually a little shorter than but occasionally subequal to fourth, fifth or sixth, which are subequal, with the fourth slightly longer. Prothorax approximately one and a half times as broad as long, with sides only slightly curved as seen from above and widest before the middle; depressed at sides of base but not distinctly so across base; surface shining and finely punctate; usually entirely pale but in dark specimens with traces of three poorly defined spots. Scutellum rounded. Elytra not much wider than prothorax, with feeble humeral prominences, very smooth, shining, and finely punctate; in pale specimens often no trace of vittation, in darker specimens a narrow reddish-brown sutural vitta usually not extending to apex and wider in the middle, rarely a trace of a lateral vitta. Under surface and legs usually pale, but in darker specimens the metasternum and abdomen may be reddish brown. Length 3 to 3.8 mm., width 1 to 1.5 mm.

Type male and 4 paratypes (1 male and 3 females), U. S. N. M. Cat. No. 50117, collected by F. S. Nunenmacher, in Esmeralda Co., Nevada, 7 June, 1907.

Other localities.—California (Geysers, Los Angeles, Pasadena, Riverside, San Diego, Santa Monica); Arizona (Clemenceau, Gila River Valley, Glendale, Globe, Tucson, Winslow); Utah (Leeds, Salt Lake); Nevada (Esmeralda Co., Reno); Colorado (Durango, Paonia, Pueblo).

This species in its pale form frequently has no trace of elytral vittae. Since *S. pallidula* Boh. is also an entirely pale species with the habitat given by Boheman as San Francisco, Calif., and Puna Island (both probably erroneously), *S. laevis,* the only entirely pale species that does occur in California, has been identified in some collections as *S. pallidula.* It differs from that species in having a wider head with wider interocular space and in having the elytra not greatly wider than the prothorax. The elytra in *pallidula* are conspicuously wider than the prothorax. It is distinguished from *S. blanda, mitis,* and *bitaeniata* by being more finely punctate. It is one of the palest and smoothest of North American species of *Systena,* rarely having a trace of a lateral elytral vitta. It differs from the pale but more coarsely punctate eastern species, *S. marginalis* Illig., by having smooth polished elytra. As is also true of *S. pallidula,* Say's description of *A. taeniata* can in no way be applied to this pale, finely punctate species. *S. semivittata* Jac., described from Guanajuato, Mexico, a cotype of which is in the Bowditch collection, differs from this species by having a narrower interocular space, more pronounced frontal tubercles, a more densely punctate vertex with a distinct median vertical line extending up from between the tubercles, and a narrower prothorax.

Systena laevis has been collected on sugar beet at Pasadena, Calif.

Systena californica, n. sp. (Fig. 12).

Elongate-oblong, slender, about 4 mm. long, polished, head and prothorax finely and not densely punctate, elytra more distinctly and densely punctate; black, antennae varying from yellowish brown to deep reddish brown, a pale median elytral vitta; tarsi and sometimes apex of femora and often head in part reddish brown.

Head rounded over occiput, tubercles not very distinctly marked, surface polished, finely punctate on front and in middle of occiput; deep piceous, often with two reddish brown areas on occiput and a paler streak below eyes. Antennae long and slender, extending nearly to middle of elytra. Third joint usually shorter than fourth, varying from a little more than half as long to being subequal; fifth, sixth and seventh joints nearly as long as fourth or subequal to it; varying in color from yellowish to reddish brown, basal joint dark and apex of each joint darker than base. Prothorax not twice as wide as long, widest a little before the middle, with rounded sides, not depressed at base, very polished and finely and not densely punctate, frequently more densely so at base, in some specimens punctation more distinct; usually entirely black, but sometimes a deep reddish margin along base. Elytra narrowly oblong, without humeral prominence, rather distinctly and densely punctate; black with a pale median vitta, this slightly wider at base. Body beneath black, apex of femora and tarsi sometimes paler. Length 3.8 to 4.4 mm., width 1.5 to 1.8 mm.

Type male and 3 paratypes (1 male and 2 females) U. S. N. M. Cat. No. 50118.

Type locality.—"California."

Four specimens of this species, bearing only the locality label "Cal." and the label "Belfrage collection," are in the National Museum collection. Other specimens, not of similar mounting but with the same locality label, are in the Bowditch collection at the Museum of Comparative Zoology, and another, a male, in the Le Conte collection labeled "Cala." with the letter F, is determined as *S. taeniata* by Horn. H. C. Fall writes me that the letter F indicates that it was collected by Crotch at Santa Barbara, Calif. Mr. Fall has in his own collection three specimens of this species, which he had recognized as new, collected by him in June in the foothills of the Sierra Madre about 5 miles north of Pomona, California. He writes that they are similar to the Le Conte specimen in being extremely finely and sparsely punctate on the head and prothorax. Still another specimen, also labeled "Cal.," is in the collection of the Illinois State Natural History Survey.

This species is easily confused with *S. bitaeniata* (Lec.), but is darker and lacks the pale elytral margin usually found in *bitaeniata*. The prothorax is not so wide, the elytral punctation is more distinct, although not coarse, and the shape of the aedeagus is quite different. It differs from Say's description of *A. taeniata* in the punctation of the elytra, which are much more densely and distinctly punctate than the prothorax, and also in the color of the legs, but otherwise it corresponds more closely with Say's description than does any other of this group examined by the writer.

Systena carri, n. sp. (Fig. 11).

Elongate-oblong, about 4 mm. long, moderately shining, head and prothorax finely and rather densely punctate, elytra usually more distinctly punctate. In pale specimens head and antennae reddish yellow, prothorax paler yellowish brown with darker clouding, elytra black with a median pale vitta wider at base and apex, margin and epipleura pale, body beneath piceous with paler brown legs; in dark specimens entire insect dark piceous except the reddish-brown antennae and tarsal joints and sometimes a paler reddish-brown margin around the pronotum.

Head rounded over occiput, dark reddish yellow or piceous with labrum always dark; finely and not densely punctate; tubercles rather indistinct. Antennae reddish or brown, not extending to middle of elytra, third joint usually very little shorter than fourth or fifth, which are subequal with the fourth usually slightly longer. Prothorax not twice as wide as long, but wider proportionately than in the *S. blanda* or *elongata* groups; sides somewhat rounded, widest a little before the middle, a slightly depressed fovea in middle of base and one on each side, in some specimens these foveae very indistinct; surface distinctly but finely and moderately densely punctate; in pale specimens color yellowish or reddish brown, paler than head, usually with poorly defined darker brown areas irregularly clouding it; in dark specimens piceous, often with anterior and basal margins narrowly reddish brown. Elytra oblong with feeble humeral prominences, usually more coarsely punctate than prothorax; in pale specimens epipleura, lateral margins, and apex pale, and a pale median vitta widening at base and connecting with pale lateral margin over humerus; in dark specimens elytra entirely piceous or with only indistinct traces of paler median elytral vittae. Body beneath lightly pubescent, piceous, in pale specimens legs reddish or yellowish brown with the posterior femora dark; in dark specimens legs nearly piceous with the tarsi deep reddish brown. Length 3.8 to 4.5 mm., width 1.8 mm.

Type male and 1 paratype (female), U. S. N. M. Cat. No. 50119, collected by F. S. Carr, at Ft. Saskatchewan, Alberta, 10 July, 1922.

Other localities.—Alberta (Edmonton, Cypress Hills).

Systena carri in its entirely dark form might possibly be confused with *S. hudsonias* Forst., but *S. hudsonias* is more slender with a narrower prothorax and with less arcuate sides, and has varicolored antennae. In its vittate form, *carri* closely resembles *S. bitaeniata* (Lec.) and *S. dimorpha* Blake.[5] All three are dark vittate species with a wide prothorax, and in pale forms all have pale elytral margins. *S. carri* may be distinguished from *S. bitaeniata* by its less polished and more coarsely punctate surface, particularly of the elytra, and by the differently shaped aedeagus. It is distinguished from *S. dimorpha* by having a less coarsely punctate head, and by not having a row of coarse punctures along the inner margin of the eye and over the frontal tubercles, which are prominent in *S. dimorpha.* There is no difference in coloration in the sexes as in that species, and the aedeagus is quite different. *S. carri* appears to be the most northern of the three species, having been found only in the mountains of the Cypress Hills range, at about 4000 ft. altitude, and in the vicinity of Edmonton, Alberta. Mr. Carr, to whom the species is dedicated, collected it at Edmonton on spreading dogbane (*Apocynum* sp.) It differs from Say's description of *A. taeniata* by being paler in its vittate form and by having more densely punctate elytra.

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[5] Blake, Proc. Ent. Soc. Wash., vol. 35, p. 181, 1933.

GROUP 2.

Systena elongata (Fabr.). (Figs. 13, 14, and 15.)

Galleruca elongata Fabr., Ent. Syst. Suppl., p. 99, 1798; Syst. Eleuth., p. 500, 1801.

Altica elongata Oliv., Ent., vol. 6, p. 694, 1807.

Systena elongata Gemminger and Harold, Catalogue, 1876; Crotch, Proc. Acad. Nat. Sci. Phila., p. 69, 1879; Horn, Trans. Amer. Ent. Soc., vol. 16, p. 272, 1889.

Haltica subaenea Le Conte, Pacific Railway Rept., p. 68, 1857.

In addition to the citations given above, the synonymy of *Systena elongata* has been more or less interwoven with that of *Phyllotreta vittata*, making the entire history extremely complicated. From his brief description of *Galleruca elongata*, there is room for considerable doubt whether Fabricius was describing a *Phyllotreta* or a *Systena*. The description, translated, runs thus: "Aeneous black with a whitish vitta on the elytra. Habitat North America, Smith Barton. Small, but longer than the others. Antennae missing. Head and thorax aeneous black, immaculate. Elytra smooth with a wide whitish median vitta. Body aeneous black, femora strongly incrassate." There is no mention of the pale legs or the distinctly punctate upper surface, and the elytra are described as "laevia." Otherwise the description may be applied to the species that is today commonly known as *S. elongata*, and until a Fabrician type can be examined the writer has no desire to change the name.

The species commonly known as *Systena elongata* is widespread over the United States, and there is little difference between specimens found in Florida, Texas, New York, and Manitoba. As in *S. blanda*, however, specimens from the Rocky Mountains and the Pacific coast do present differences in markings. A series of 4 from Lehi, Utah, has the prothorax deep reddish brown with a paler basal margin instead of entirely black. This paler prothorax is also found in 5 of 6 specimens from Washington. In California the color is even more variable. In a series of 4 females from Sacramento, 2 are like the eastern specimens, 1 is slightly paler along the basal margin of the prothorax, with the vittae represented only by two spots at the base of the elytra, and 1 is entirely dark except for the antennae and legs, the posterior femora of which are dusky. A similar variation in color is shown in another series labeled simply "California." A large series in the collection of the Illinois State Natural History Survey, from Huntington Beach, Calif., cannot be distinguished in any way from the eastern specimens.

Le Conte described *Haltica subaenea* from a single entirely dark female from San José, Calif. (Museum of Comparative Zoology Type No. 4457). There is a second specimen in his collection, of which he made no mention at the time of his description, also bearing a gilt label indicating the locality California. It is likewise a dark female, and although with no trace of elytral vittae, it has a little paler head and a barely distinguishable paler streak along the base of the prothorax. The aedeagi of the dark Pacific coast forms do not differ from those of the eastern vittate specimens, and the occurrence of both forms together in several series of specimens from the West indicates that this dark form is scarcely worthy of distinction in nomenclature.

Specimens of *Systena elongata* have been examined from the following localities: New York (Binghamton); Maryland (Breton Bay, Chesapeake Beach, Chapel Point, Cabin John, Bladensburg); Washington, D. C.; Virginia (Clarendon, Mt. Monroe, Ragged Point, Rosslyn); North Carolina (Wilmington); South Carolina (Calhoun, Holly Hill, Pregnall); Florida (Haw Creek, Haulover, Enterprise, P. Orange); Alabama (Alberta, Coleta, Marion, Selma); Mississippi (Hattiesburg, McCalla, Natchez, Pachuta, Port Gibson, Utica); Louisiana (Baton Rouge, Berwick, Avery Island, Lake Charles, Mound, Opelousas, New Orleans); Texas Kirbyville, Trinity); Arkansas (Camden, Danville); Nebraska (Westpoint); Tennessee (Elmwood, Nashville); Illinois (Grand Tower, Pulaski); Minnesota (Duluth, Fergus Falls); South Dakota (Brookings, Volga); Utah (Lehi, Kaysville); Manitoba (Rosebank); Washington (Chehalis, Pullman); California (Fresno, Huntington Beach, Los Angeles, Sacramento, Siskiyou).

It has been collected on the following plants: alfalfa (Sacramento, Calif.); *Ambrosia* sp. (Avery Island, La.); beets (Norfolk, Va.); cotton (Marion, Ala.); potato (Bladensburg, Md.); radish (Baton Rouge, La.).

Systena basalis Jaquel. (Fig. 16.)

Systena basalis Jaquel., Historia de la Isla de Cuba, vol. 7, p. 129, 1856.

In the West Indies occurs a species, *S. basalis* Jaquel., closely related to *S. elongata* but differing from it mainly in having the sexes differently marked. The proportions, color, punctation, and aedeagus are very similar to *S. elongata,* and the male beetle is practically indistinguishable from it. The female, however, instead of having an entire pale elytral vitta, has only a small basal pale spot, or at most a basal and an apical pale spot.

Systena thoracica Jac. (Fig. 17.)

Systena thoracica Jacoby, Biol. Central. Amer., vol. 6, pt. 1, p. 333, 1884.

Systena bohemani Jacoby, Biol. Central. Amer., vol. 6, pt. 1, p. 334, 1884.

In Mexico and Central America occurs a third species (the male described by Jacoby as *S. bohemani,* the female as *S. thoracica*), also closely related to *S. elongata* and *basalis* and, like *basalis,* showing sexual differences in coloration. In a previous publication[6] I synonymized *S. thoracica* with *S. basalis,* but study of a larger series of specimens and comparison of the aedeagi have convinced me that this is a distinct though closely related species. It differs from *basalis* in that the aedeagus has a slightly more pronounced lobing near the tip, as can be seen from the illustration, and also in that the sexual difference in coloration is not exactly the same as in *basalis.* In *basalis* the elytral vitta is entire in the male but seen only as a basal and sometimes apical spot in the female. The coloring of both sexes is black or aeneous black. In the female of *thoracica,* the elytral vitta may be complete or represented only by a spot at the base, or lacking. In the male, the vitta may be entire or represented only by a basal spot. But the male of *thoracica* is pale reddish brown whereas the female is black. In the limited number of specimens at hand it appears that the entire elytral vitta is more frequently present in the male than in the female; in other words, the female tends not only to be darker in coloring but to lack the vitta, as in the West Indian species.

In the specimens at the National Museum, the only difference between a male and a female from La Ceiba, Honduras, is that the male is pale reddish brown and the female black, both having entire elytral pale vittae. In three specimens from Tuxtla, México (type locality of *bohemani*), one male is like that from La Ceiba, being pale reddish with an entire elytral pale vitta, one female, also vittate, is piceous but not quite so dark as the female from La Ceiba, and the second female is black with only a basal spot representing the elytral vitta. A pair from Ingenio, Guatemala, is colored like those from La Ceiba. In a pair from Cobán, Guat., both sexes have only a pale basal spot on the elytra, but the male is reddish and the female darker. In a pair from Chinandega, Nicaragua, the elytral vitta is present in both sexes and the female is only a little darker than the male. One female from Colima, México, which I believe is of this species, is entirely dark.

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[6] Blake, Bull. Brooklyn Ent. Soc., vol. 26, p. 80, 1931.

In the Bowditch collection at Cambridge, Mass., under *bohemani* is a cotype of *S. bohemani,* a male, from Tuxtla, México, and another specimen, a male, from Vera Cruz, México, the latter collected by H. H. Smith. Both are pale reddish brown with entire elytral vittae. These are from Jacoby's collection. Following these is a series of 7 from Manatee, British Honduras, determined as *bohemani* by Bowditch. Of these 5 are males of the typical pale tan coloring and with entire pale yellow elytral vittae, and 2 are dark females, 1 with the elytra entirely dark except for a dot at the base of the elytra, and the other with an entire elytral vitta. Bowditch, disregarding the similarity of these dark females to Jacoby's *thoracica,* rightly regarded them all as one species.

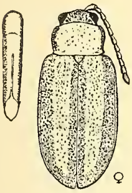
A paratype of *S. thoracica* from Dueñas, Guata., the first locality mentioned by Jacoby, a female, is black with a very narrow pale elytral vitta; another paratype from Zapote, Guata., also a dark female, is similarly marked but with a wider pale vitta; a third paratype from San Gerónimo, Guata., and two from Orizaba, México, all females, are black with only a pale spot at the base of the elytra. There are 3 more dark females with entire pale elytral vittae, 2 of them from Vera Cruz, collected by H. H. Smith, and evidently of the same series as the single pale male labeled *bohemani.*

EXPLANATION OF PLATE III.

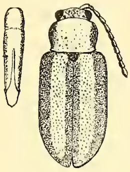
Fig. 1. *S. blanda* Melsh., cotype (♀) in Melsheimer collection; aedeagus of specimen from Philadelphia, Pa.
Fig. 2. *S. blanda* Melsh., dark variety, from Estancia, N. Mex.
Fig. 3. *S. blanda* subsp. *ligata* (Lec.), type (♀) of *ligata* in Le Conte collection; aedeagus of specimen from Sacramento, Calif.
Fig. 4. *S. blanda* subsp. *ligata* (Lec.), type (?♀) of *ochracea* in Le Conte collection; aedeagus of specimen from Huntington Beach, Calif.
Fig. 5. *S. pallidula* Boh., cotype (♀) from Stockholm Museum.
Fig. 6. *S. mitis* (Lec.), type (?♀) in Le Conte collection; aedeagus of specimen from Yuma, Ariz.
Fig. 7. *S. mitis* (Lec.), variety from Amarillo, Texas.
Fig. 8. *S. mesochlora* n. sp., San José, Costa Rica.

Fig. 9. *S. laevis* n. sp., Esmeralda Co., Nev.
Fig. 10. *S. bitaeniata* (Lec.), cotype (♂) in Le Conte collection; aedeagus of specimen from Arizona.
Fig. 11. *S. carri* n. sp., Cypress Hills, Alberta.
Fig. 12. *S. californica* n. sp., California.
Fig. 13. *S. elongata* (Fabr.). Chapel Point, Md.
Fig. 14. *S. elongata* (Fabr.), dark variety, type (♀) of *subaenea* in Le Conte collection; aedeagus of dark specimen from California.
Fig. 15. *S. elongata* (Fabr.), vittate form from California.
Fig. 16. *S. basalis* Jaquel., Bayamón, P. R.
Fig. 17. *S. thoracica* Jac., ♂ and 2♀♀, Tuxtla, México.

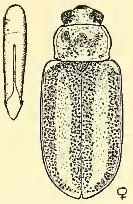
Geotrupes ulkei Blanchard.—With ten years interval I had taken two specimens of this apparently rare beetle under rocks on Monte Sano, Madison Co., Ala. On a visit to the mountain last June our party set out to learn something more about this evasive species. Turning rocks brought no results. (And did we turn rocks? An old man coming down the mountain path saw us at work, stood stock still for a while and finally asked what we thought we were doing. When told we were hunting beetles he chuckled and said, "Well, I'll be damned; I have walked these mountains for years and this morning I couldn't think what was up for every doggone rock on the mountain was turned upside down. Them must be goldbugs you are hunting sure enough.") Giving up the rocks, which by the way yielded many fine Carabids, we turned to scratching leaves and finally Dr. Jones gave a yell—there was our *Geotrupes* close to a small cylindrical hole in the ground, in diameter the size of a lead pencil and about an inch and a half deep, with some leaf frass at the bottom. Looking for holes in the ground was the next order of business and brought fourteen specimens all similarly located under leaves on level ground at the side of mountain paths, never more than one specimen in a hole one and a half to two inches deep with leaf frass at the bottom, no larvae. In July, Dr. Jones again visited the mountain and this time besides several beetles also found three larvae, two in one hole and one in another. The food seems to be decomposing leaves. And so endeth another rare species.—H. P. Löding, Mobile, Ala.



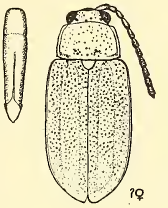
1. S. blanda
(Cotype)



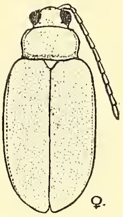
2. S. blanda
(Rocky Mt var.)



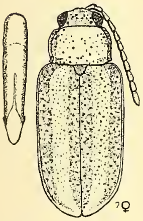
3. S. blanda
ssp. ligata (Type)



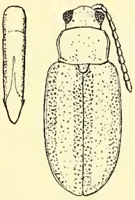
4. S. blanda ssp. ligata
(Type ochracea)



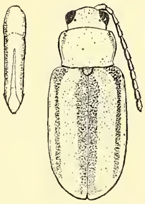
5. S. pallidula
(Cotype)



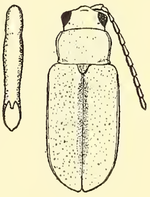
6. S. mitis
(Type)



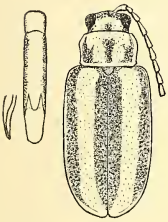
7. S. mitis
(from Texas)



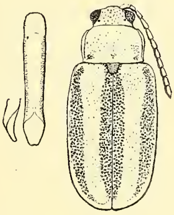
8. S. mesochlora



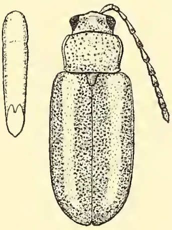
9. S. laevis



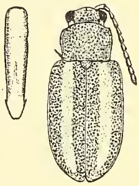
10 S. bitaeniata
(Cotype)



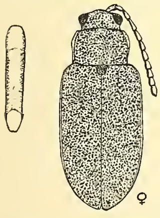
11. S. carri



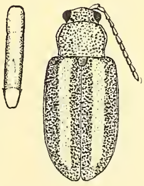
12. S. californica



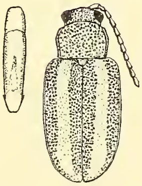
13. S. elongata
(from Maryland)



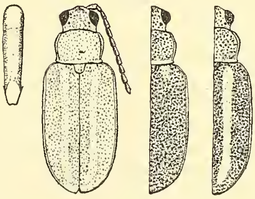
14. S. elongata dark var
(Type subaenea)



15. S. elongata
(from California)



16. S. basalis
(from Porto Rico)



17. S. thoracica ♂ ♀ ♀
(all from Tuxtla, Mex.)

NOTES ON THE BIOLOGY OF CERTAIN EUMENID WASPS.*

By Phil Rau, Kirkwood, Mo.

Odynerus perennis Sauss. Twigs collected in January, 1928, in St. Louis County, Mo., gave forth three adults, June 1 to 5, of the same year. The three that emerged came from the top cells in the twig; the lower three cells contained dead adults that apparently could not bite their way through the mud partitions.

Odynerus designatus Cress. One specimen feeding on flowers of white snakeroot on banks of the Meramac River at Allenton, Mo.

Odynerus (*Stenodynerus*) *pedestris* Sauss. A sumac twig taken at House Springs, Mo., August 7, 1932, when opened was found to have two adults in the cells ready to emerge. The twig was excavated by some other insect, and reused by this wasp. The partitions were made of mud and were very thin; the cells measured three-fourths inch in length and there was a two-inch vestibule between the outside plug and the first cell-wall.

Odynerus pennsylvanica Sauss. A twig containing a nest of this species was taken May, 1928. One June 5, 1928, a wasp of this species emerged and a month later a parasitic fly emerged from another cell in this nest. The fly was identified by Mr. C. T. Greene as *Spogostylum oedipus* Fab.

Odynerus foraminatus Sauss. This species does not spin a cocoon when ready to pupate as do many of the sister species, but the larvae do show vestiges of this spinning habit, which of course indicates that sometime, somewhere, possibly in other climes or places, cocoon spinning was a normal occurrence. In opening up a hollow stem containing a nest of this species on July 27, 1930, I found all of the pupae naked, but I also found that each larva before pupating had used what little spinning material it possessed in making an attempt to revive this old habit. The male in cell No. 3 had spun a diagonal sheet upon which it rested, the female in cell No. 1 had had enough material to build a wall in front of her head, while the female in cell No. 2 had spun a very thin web across the floor. The larvae of other species in this genus, *O. dorsalis* for instance, which over-winters in the ground, spins tough waterproof cocoons, but here, at least in the summer brood of a twig dwelling Odynerus, we see no need for this protection; therefore *O. foraminatus* has almost entirely lost the habit of cocoon spinning.

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* All specimens of wasps were identified by Dr. Grace Sandhouse.

However, *O. foraminatus* may have a second generation that winters over in the larval stage, if so it would be interesting to compare the spinning propensities of those that over-winter with those that mature during the summer.

Ancistrocerus (*Pseudodynerus*) *quadrisectus* Say. On September 1, 1930, six female wasps were seen carrying caterpillars to their nests at Wickes, Mo. The nests were in the abandoned burrows of the carpenter-bee *Xylocopa virginica.*

Ancistrocerus (*Ancistrocerus*) *catskillensis* Sauss. This species was introduced about my home in the nests of the common mud dauber collected in St. Louis County. While the introduced stock nested in mud-daubers cells, their progeny nested in old nail- and key-holes about the house. At St. Albans, Mo., several mothers were seen carrying caterpillars to their nests in the abandoned burrows of the mining bee, *Anthophora abrupta,* in a clay bank.

Ancistrocerus waldeni Viereck. At Devils Lake, Wisconsin, on May 20, 1932, I removed a mud wall covering a small "V" shaped depression in a rock, and found this mother wasp, a half dozen

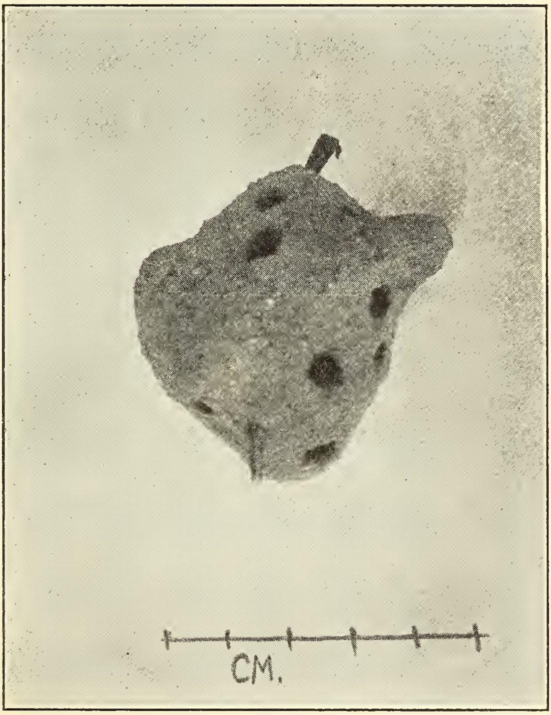

Fig. 1.

small green caterpillars, and an egg hanging from the roof by a silken thread. The egg was evidently deposited before food was provided, and the mother was still bringing in her prey when her work was interrupted. The caterpillars were very active and remained alive for several ways, the last survivor dying six days later.

Ancistrocerus birenimaculatus Sauss. A mud nest taken at Flushing, N. Y., and sent to me by Mr. Kenneth W. Cooper gave forth eight adults (5 females and 3 males) between May 20 and June 1, 1930. The nest, attached to a stem (fig. 1) was taken in the open and was undoubtedly made by this species. This masonry habit of nest building is unusual for members of this genus; the nest resembles somewhat in appearance that of our common mud dauber *Sceliphron caementarium*; the latter, however, at least in St. Louis climate, do not build nests exposed to the weather.

Ancistrocerus fulvipes Sauss. This wasp is frequently seen about my garden, sometimes flying to her nest with a caterpillar dangling from her jaws. When the prey is too large it impedes her flight, and on one occasion I saw a mother wasp meet the situation in a very intelligent way. The caterpillar was unusually long and unwieldy; I saw her rest on a leaf, deliberately fold the prey in half; then grab its middle in her jaws, and by tucking the two dangling ends flat against her thorax and holding them in place with the middle pair of legs, she flew without difficulty to her nest. This was in an old bee burrow in the clay bank.

Erratum: On page 67, 4th line from bottom, "Fig. 1" should read "Fig. 3."

A Psocid, Psoquilla slossonae (Banks), (*Psocinella slossonae* Banks) was found last October in great numbers on the plastered walls of a bungalow in Mobile, Ala. The house had been closed for some months and the minute booklice were found hiding in nearly every little pit and pinhole on the wall. When disturbed they jumped clear and out of sight, but with a reading glass and a vial of alcohol in one hand and a camelhair brush in the other I managed to satisfy Mr. A. N. Caudell, of the National Museum, of the identity of the species, which until I got it under the microscope and saw it had wings—two well developed and two vestigial, I took to be a springtail. It seems this is the third record of the species in the United States, the type specimens were found by Mrs. Slosson on butterflies drying on her spreading boards in 1900, and a later record also from Florida came from a library in Jacksonville.—H. P. LÖDING, Mobile, Ala.

BIOLOGICAL NOTES ON ARADIDAE.

By J. R. de la Torre-Bueno, Tucson, Arizona.

The three species of this family found at Onteora, in the Catskills, alt. 2,400 feet, were *Aneurus inconstans* Say, *Aradus robustus* Uhler, and *A. quadrilineatus* Say.

As to *Aneurus inconstans,* data on occurrence have relatively little significance. I have found this species—adults, nymphs and ova—in winter under suitable bark. On August 16, 1932, *A. inconstans* was found under bark of a small beech log lying in a shady spot by a roadside. The 20 adults secured were found under rather close-lying loose bark, *not* damp—in fact, it felt dry to the hand. On July 1, 1933, I got a few more under bark of another fallen log. They were found under somewhat dry bark on the smaller branches, where it was cracked and loose. On September 3rd, under loose bark, three adults and one half-grown nymph of the species were noted. On July 5, 1934, under bark—and fairly tight bark, too—of a short end of a maple log lying on the ground among bushes, a number of adults were found together with several groups of eggs. They were along the loose edges of the bark where it was separated from the trunk, but dry; none was found where it was damp. The eggs were attached to the surface of the wood and *not* on the underside of the bark, as is the case with *Neuroctenus.*

The two species of *Aradus* gave more interesting results. *Aradus quadrilineatus* appears to be an inveterate rambler. It was found abroad singly, apparently at rest from flight, on a number of occasions. On July 22, 1933, at 6: 30 p. m., one was found perched on one of the flags of the walk; on the 28th, another was found on one of the stone steps. On July 15, 1934, one was picked up on the high house porch. This habit had been noted before on a warm April day in New England, when *A. quadrilineatus* was seen perched on bean-poles in a pile, in the sunlight, ready for flight; and frequently since. On August 16, 1932, on the outside of the beech log where *Aneurus* was found and at the same time (about 10 a. m.) near a crack in the bark were one large and one small nymph, which reached the adult on August 24, a week later; the larger was *quadrilineatus* and the smaller *A. robustus.* On July 11, 1933, from the damper parts of a fallen log noted nymphs of *A. quadrilineatus,* from the last to the third instar. The following year, on July 4, I saw two *quadrilineatus* nymphs on a log near a road, one about 2nd and the other 4th(?) instar, both walking about. They did not come from the damp parts under the bark, but apparently from the dryer, whence I disturbed them. Again on July 9 I noted the same 5th instar nymph. It was sitting on the bare upper side of the log, where the bark had been peeled off, in the full sunshine. It appeared to be asleep—at least, it was in the resting position and entirely motionless—antennae stretched straight forward held close together and apparently resting on the surface; the body likewise lying right on it. I watched for two or three minutes and it did not move in that time, not even the usual vibration of the antennae, which among the aradids appears to indicate attention or alarm. Again on July 14, I saw the same two nymphs on the bare part of the log, in resting position. During the greater part of the day they are concealed under the dry part of the bark. A little later, the larger nymph had concealed itself entirely; and the smaller had taken shelter under the loose edge of the bark. On the end of the log, on the bare wood, was another smaller nymph, possibly 2nd instar; this was paper-thin, while the older nymph was quite thick through the body—obviously about to molt. Cigarette smoke was blown on the smaller nymph, which began to walk about apparently aimlessly. On July 15, at 1:30 p. m., the three nymphs were found after some search and put in a glass jar together with same pieces of bark for their shelter. These nymphs appear not to be negatively heliotropic. They were put in the full daylight from a window while in resting position and it did not disturb them in the least. When touched, they feigned death, keeping the legs close to the body, antennae closely held together and pointed forward and absolutely motionless. While in captivity they were very inactive—at least, they got progressively thinner until they died some time in late August without any of them transforming to the adult.

Aradus robustus was first found under loose bark of a beech log, a nest of nymphs on July 25, 1932. Two of these same nymphs were noted on the outside of the log, in the sun, on August 4. On August 16 I once more noted two nymphs on the outside of a beech log near a crack in the bark, the larger of which was the *quadrilineatus* before mentioned; and the smaller, which came to the adult some time between the 24th and 28th turned out to be robustus. On July 3, 1933, one adult *A. robustus* was taken; another was found on July 19, in company with four nymphs from the 2nd to the 5th instars. These were kept alive, but did not survive in captivity. The last *robustus* to be taken was recorded on July 27, 1934, from under the bark of a hemlock log lying along the road over the dam at the lake.

NOTES ON THE DIURNAL LEPIDOPTERA OF THE CANADIAN ARCTIC COLLECTED BY OWEN BRYANT IN THE SUMMERS OF 1929 TO 1932.

By R. A. Leussler, Omaha, Nebraska.

With Introduction and Field Notes
By Owen Bryant, Tucson, Arizona.

III.

Notes on the Species.

By Owen Bryant.

The editor very kindly submitted to me the proof of this article thereby enabling me to make the introduction agree better with the final draft of the body of the article which I had not seen. The following notes on the species occurred to me. The numbers refer to the numbers used in the text.

(8) *Colias nastes* race *rossii* as it occurs on Herschel is a dark dwarf race.

(11) Mr. Donald Mackie, of Edmonton, Alta., took a specimen of *Oeneis jutta* at Bilby, Alberta, which seemed to me as dark as the Arctic specimens and quite like it though the two were not directly compared. *Jutta* is fairly common in a spruce muskeg at Bilby but all the specimens I took or saw there during a summer's collecting were normal, and Mackie took only one or two dark ones in many seasons. On the other hand all the specimens seen in the Arctic were of the dark form. I believe it deserves to be recognized as a distinct subspecies and therefore propose for it the name **leussleri** subspecies nova.

(26) Leussler's remark, "An early summer species," suggest the following notes on the Arctic summer. The season is very different in the delta region, and probably in the southern portion of Bathurst Inlet, as near as I could learn from the Police who often winter there on their boat the St. Roche as a floating detachment. The Police boat is always free to move in the Inlet long before it is possible for it to round Cape Bathurst on its yearly trip for supplies to Herschel Id., which it generally reaches late in July.

The coast west of the Delta, including Herschel Id., is cold and continually beset with ice in summer. The coast near Bernard Harbour is even colder and occasionally almost shut off by ice throughout the season. The coast east of Bathurst Inlet is extremely cold in winter and, I believe, also in summer. Many instances are recorded in Johansen's notes of butterflies flying when the temperature was 44° to 56°. *Polygonia* is the only butterfly genus seen flying in the Delta region in weather approaching that. It was flying over snow but in a warm sun.

In the Delta region spring and willow blossoms appear about May 15th. The river ice goes out about June 1st at which time summer may be said to begin and insects to be numerous. Before June 1st few insects appear and those are mainly species which are found in greater numbers later. Only a few species like *Tilea* can be taken easier on the snow than they can later.

By July 1st the summer is half over from the point of view of insect emergence and many species were not taken much after that date. It may be considered mid-summer. In some seasons at the end of July, in others at the end of August, cold stormy weather may set in and last almost continuously throughout the balance of the season with the final freeze-up taking place about October 1st or sometimes much earlier. 1929 was very fine through most of September enabling me to get an unusual number of species for that season. About 160 species of beetles were taken although I did not arrive at Aklavik until August 26, on which date I got 6 species of *Syrphidae* with one swipe of the net on one of the few flowers remaining, a large *Senecio.*

(29) Only 1 specimen of *improba* showed anything approaching the marked purple band of *frigga* and most of them show no suggestion of it as I remember them.

More specimens occurred at the higher altitude on Black Mt., and therefore more variation might be expected there.

(30) *Brenthis distincta* is a strong flier and can be recognized on the wing mostly through its greater size. It flew principally over low herbaceous plants or along the edge of a three foot growth of black birch, alder and willows.

(32) *Polygonia arcticus* seen on May 13, on the slope of Black Mt., at 500 to 1000 feet, were flying actively over the snow on which we were still travelling by dog sled and on skis.

(33) No specimens of *Polygonia* were seen in the late part of any of the four seasons spent in the Delta. It seems to me therefore more likely that they do not emerge until spring, regardless of their habits elsewhere. Any one who has seen the effect of an Arctic snow storm on the butterflies would not expect to find good specimens, in spring, of species which emerged the previous summer. Apparently no good specimens are found after a snow storm except those which emerge after the storm.

(34) A number of *Aglais j-album* in nice condition were flying along the beach at Norman. This locality is in a well wooded region, with the timber line at about 4000 feet. It is several hundred miles up the Mackenzie from the Coast or even the Delta, which begins below Arctic Red River, and therefore has little bearing on the question of emergence of *Polygonia* in spring or fall in the Delta.

(38) *Everes amyntula* seemed to be of a much deeper blue than Alberta specimens.

(45) *Lycaenopsis marginata.* These struck me as being lighter and more silvery in color than Alberta specimens.

Alberta has more than 150 species of butterflies, many of which extend into the Mackenzie basin which includes the water of the Peace, Athabasca and Mackenzie rivers with Lake Athabasca, Great Slave Lake, Great Bear Lake and the waters emptying into them.

The Mackenzie basin is a more or less homogeneous region gradually changing from a Canadian fauna and flora in the south to an Arctic fauna and flora in the north. On the west it is bounded by the Continental Divide, on the south by a warmer region whose waters flow into Hudson Bay and on the east by the Hudson Bay drainage area. The region sloping east into Hudson Bay is noticeably colder than that sloping west into the Mackenzie. The region sloping east from the crest of the Rockies to the Mackenzie has a rather early spring as recorded by geologists who wintered at the head waters of the Gravel River west of Ft. Norman. The Liard River comes from a warm region and the ice goes out of it long before the Mackenzie ice breaks up. Somewhere near its head waters is what is known as the "Tropical Valley," it is so warm.

Timber line in the Rockies near Banff is 7000 to 7600 feet; at Ft. Norman it is about 4000 feet; while west of Aklavik it reaches about 700 feet only in the most favorable locations.

About Banff the fauna is a pure Canadian fauna at 4500 feet which drops out by degrees up to timber line where the remaining species mingle with those of the Arctic Alpine Region which zone has a very limited fauna peculiar to it. The highest portions of the Alpine region is occupied mainly by small *Hymenoptera.* No recognizable Hudsonian zone occurs in the Rocky Mts., either in plants or animals. The changes met in going from the southern Alberta plains to the summit of the Rockies is therefore very similar to those experienced in going to the Arctic ocean via the Mackenzie River though less marked.

The fact that the distribution of insects does not correspond with that of their food plants is apparently very obvious when collecting in the Arctic. For example, certain families of beetles had escaped me in the Arctic but when I located colonies of *Spiraea* in 1931 they were quite devoid of *Mordellidae* which family can always be taken on it in Alberta. Some *Histeridae* occur in scolytid borings in spruce, others are very fond of dead fish in Alberta. I was entirely unable to find any specimens of *Histeridae* in the Delta, though I searched under acres of bark and put out fish for bait. The farthest north I found the family was at Simpson though no doubt it goes farther north than that. Roses have practically none of the fauna on them that occur in Banff. No *Rhynchites* or *Pachybrachys,* and no *Cynipidae* making stem or root galls were found on rose. No *Chalcididae* were bred from rose seeds in the Arctic.

References: Harper (Churchill Butterflies), Can. Ent.,? 1933,? p. —?. Paper on Butterflies of Baffin Land and Ellesmere Land in Can. Ent.,? 1932,? p. —?.

Note on Hypeogeocoris piceus Say.—This species is not uncommon; and it may always be found where five-finger (*Potentilla canadensis*) covers the ground. I always have searched for it in order to get specimens of the extremely rare macropterous form —so rare that in my thirty years' collecting I have not found more than three or four. This search I carried on constantly and sedulously in my three summers in the Catskills. In this period, I did not see more than 30 or 35 adults in spite of the abundance of their food plant in the field where I sought them, in Tannersville. The first nymph of the species was noted on July 27, 1933, and the first adult on July 30, 1934; the last nymphs on August 18 of that same year, and the last adult on September 17, 1932. Of these adults, five were macropterous, an unusual proportion when it is borne in mind that in the lower latitude about New York City, so few had been taken before among hundreds of adults secured. The nymphs of this species are readily known from those of the others of the genus *Geocoris* by their shining jet black body relieved by their bright red, very prominent eyes.—J. R. de la Torre-Bueno, Tucson, Arizona.

On Mosquitoes.—An entomologist reports that mosquitoes can get along and be amply nourished without preying on humans. Don't tell us—tell the mosquitoes.—*Newspaper.*

ADDITIONS AND CORRECTIONS TO THE REVISION OF NORTH AMERICAN VESPINAE (ENTOMOLOGICA AMERICANA, 1932).

By J. Bequaert, Department of Tropical Medicine,
Harvard Medical School.

I intend publishing from time to time additional information on the Nearctic Vespinae, based largely upon material sent in for identification. Except for some of the rarer forms, I shall only put on record localities which add a State to the known range.

CHECK LIST OF NORTH AMERICAN VESPINAE.

It has been suggested that it might be useful to have a list of the several forms recognized as valid, together with their synonyms, so that their relationship might be ascertained at a glance.

Vespa Linnaeus.

1. *Vespa crabro* var. *germana* Christ. (Introduced).

Vespula C. G. Thompson.

Subgenus Vespula, proper.

1. *Vespula vulgaris* (Linnaeus) (Syn.: *communis* H. de Saussure; *alascensis* Packard; *westwoodii* Shipp).
2. *Vespula maculifrons* (R. du Buysson) (Syn.: *communis* var. *flavida* Sladen).
3. *Vespula pensylvanica* (H. de Saussure) (Syn.: *occidentalis* Cresson).
4. *Vespula rufa* (Linnaeus). Represented in North America by the varieties:
    - 4*a*. var. *intermedia* (R. du Buysson).
    - 4*b*. var. *atropilosa* (Sladen).
    - 4*c*. var. *vidua* (H. de Saussure).
    - 4*d*. var. *acadica* (Sladen) (Syn.: *rufa* var. *americana* R. du Buysson).
    - 4*e*. var. *sladeni* J. Bequaert.
    - 4*f*. var. *consobrina* (H. de Saussure) (Syn.: *scelesta* McFarland; *sulcata* Howard).
5. *Vespula austriaca* (Panzer) (Syn.: *borealis* F. Smith; *arborea* F. Smith; *tripunctata* Packard; *infernalis* H. de Saussure).
6. *Vespula squamosa* (Drury) (Syn.: *lineata* Fabricius; *cuneata* Fabricius; *cruciata* Lepeletier; *carolina* Lepeletier; *bistriata* McFarland; *macfarlandi* Lewis; *conchacea* Christ).
7. *Vespula sulphurea* (H. de Saussure).

Subgenus DOLICHOVESPULA Rohwer.

8. *Vespula maculata* (Linnaeus) (Syn.: *maculata americana* Christ).
9. *Vespula arenaria* (Fabricius) (Syn.: *borealis* W. Kirby; *diabolica* H. de Saussure).
   9*a*. var. *fernaldi* Lewis.
10. *Vespula norwegica* (Fabricius) (Syn.: *britanica* Leach; *borealis* Zetterstedt; *saxonica* var. *arctica* Friese).
    10*a*. var. *norvegicoides* (Sladen).
    10*b*. var. *albida* (Sladen) (Syn.: *marginata* W. Kirby; ? *peruana* H. de Saussure).
11. *Vespula adulterina* (R. du Buysson) (Syn.: *norvegica saxonica* natio *colchica* Birula).
    11*a*. var. *arctica* Rohwer (Syn.: *borealis* Lewis).

ADDITIONAL RECORDS AND OBSERVATIONS.

E. O. Essig (1926, p. 885) records observations on a *Vespula* of the Northwestern States which builds its nests in holes in the ground. According to W. B. Anderson, in this case the mouth may be surrounded by a small clay chimney to keep out the water. This interesting departure from the usual behavior of Vespinae should be confirmed, and the species of wasp which has acquired this peculiar habit should be determined.

Vespa crabro Linnaeus.—According to information received from Mr. Chas. S. Anderson, the European hornet is now widely distributed in southeastern Pennsylvania. He sent me specimens from Linglestown, Rockville and Clarks Valley, and he wrote me that at the State Bureau of Plant Industry, at Harrisburg, there are records on file from Port Clinton, Hawley, Minersville, E. Stroudsburg, Lansdowne, Williamsport, Montoursville, Lebanon and Palm. M. Rothke and P. P. Calvert (1932) give additional Pennsylvania records: Scranton, Lackawanna Co.; Swarthmore, Cheyney, New Britain. I have seen a male taken by T. W. Cook at Norfolk, Virginia.

Vespula vulgaris (Linnaeus).—I have now seen males of this species from Iowa (Ledges State Pk., Boone), New Hampshire (Jaffrey), and Indiana (Shades); and queens and workers from Montana (Hill Top Mt., Ravalli Co.), Arizona (Alpine, 9,000 ft.), and Pennsylvania (State College).

I should have mentioned that, as early as 1857, F. Smith (Stainton's Entomologist's Annual, p. 30) wrote: "The *Vespa vulgaris* of Europe cannot be specifically distinguished from what has been considered to be its American representative."

J. Wyman's (1861) observations relate to *V. maculifrons,* not to *V. vulgaris.*

Vespula maculifrons (R. du Buysson).—I have seen queens and workers of this species from Rhode Island (Providence) and males from Indiana.

J. Wyman's (1861) observations on the nest of an undetermined *Vespa,* were based upon *V. maculifrons,* as shown by part of the material (workers, queens and males) taken from the nest and recently found by Mr. R. Dow at the Boston Society of Natural History.

Vespula pensylvanica (H. de Saussure).—I have seen males of this species from Montana (Lake Ronan, Lake Co.; La Salle, Flathead Co.; Ravalli Co.).

On p. 95 of the "Synopsis," line 16 from below, correct the typographical error "pensylaniva" to "pensylvanica."

Vespula rufa var. *sladeni* J. Bequaert.—I have seen this form from Montana (Lake Ronan, Lake Co.) and Idaho (Troy; Horse Creek, Lemhi Co.). Also several additional specimens from Washington State (Mt. Rainier; Keyport; Friday Harbor), Oregon (Antelope Mt., Harney Co.; on the trail between Breitenbush Springs and Lake Leone, 2,222 to 3,900 ft.), and British Columbia (Walhachin; Vernon).

Vespula rufa var. *consobrina* (H. de Saussure).—I have seen this wasp from Indiana and Rhode Island.

Vespula rufa var. *vidua* (H. de Saussure).—I have seen this wasp also from Ohio (Crane Hollow).

Vespula rufa var. *acadica* (Sladen).—An interesting additional record is a queen taken by Mr. R. Dow at Reading, Massachusetts, April 30, 1933. Prof. C. H. Kennedy also sent me a series of workers from Douglas Lake, Cheboygan Co., Michigan, where this form occurred together with the var. *vidua.*

Vespula austriaca (Panzer).—I have seen additional specimens from Washington State (Mt. Rainier), Idaho (Troy), New Mexico (Little Tesuque Canyon near Santa Fe), and British Columbia (Mt. Cheam).

Vespula squamosa (Drury).—The following name should be added to the synonymy of this species: *Vespa conchacea* Christ, 1791, Naturgesch. Insekten Bienen Wespen u. Ameisengeschl., p. 259, Pl. XXV, fig. 5; no sex; "New York"; with a reference to "Drury, I, p. 98."

At the Museum of Comparative Zoölogy there are a worker and a queen taken by Dr. W. M. Mann at San Miguel, Hidalgo, in the State of Chihuahua (Mexico), west of the 100th Meridian. I have also seen a queen from Blount Co., Tennessee (C. H. Kennedy).

Vespula maculata (Linnaeus).—I have seen this species also from Wyoming (Moose P. O., Jackson Hole, 6,600 ft.), Montana (Laken Ronan, Lake Co.; Medicine Springs, Ravalli Co.; Hamilton; Hill Top Mt., Ravalli Co.; Blodgett Can., Ravalli Co.), and Mississippi (Oxford). The northernmost locality known to me in British Columbia is Chilcotin (near 52° N. lat.).

Vespula arenaria (Fabricius).—I have seen the typical form of this species also from Idaho, Washington State (Mt. Rainier), and Ohio.

I should have mentioned that Fabricius in 1775 briefly described the nest of his *V. arenaria*: "Habitat in Americae arenosis, favos struens planos, horizontales, incumbentes; cellis hexagono-prismaticis, deorsum spectantibus." This description, of course, refers to one of the combs, apparently sent with one of the workers.

In connection with the nesting habits, some years ago (1925) Prof. J. C. Bradley called my attention to the fact that *V. arenaria* sometimes builds true aërial nests. He himself observed two such nests near Ithaca, N. Y., one of them suspended about 15 ft. in the air on the side of a house. In both cases he positively identified the species of wasp.

Vespula norwegica var. *norvegicoides* (Sladen).—Four workers of this form were collected at Douglas Lake, Cheboygan Co., Michigan, by Prof. C. H. Kennedy.

Vespula norwegica var. *albida* (Sladen).—As Prof. Cockerell has pointed out (1932), the name *Vespa marginata* Kirby, 1837, is antedated by *Vespa marginata* Gmelin, 1790, in Linnaeus' Syst. Nat., 13th Ed., I, 5, p. 2766 (based upon an European fossorial wasp of unknown identity). Two names placed in the synonymy of "*marginata* Kirby" are available to replace it. The older is *Vespa peruana* de Saussure (1868), based upon workers supposedly from "Peru altior [=Ecuador]; Quito." The synonymy of this wasp with "*marginata* Kirby" is based upon the study by R. du Buysson of one of the types, presumably received from de Saussure. Recently I inquired from Dr. F. Maidl whether the true type of *peruana* was not at the Vienna Museum; but he writes no specimen of either *peruana* or *marginata* is in their collection. Possibly de Saussure retained *peruana* for his own collection which is now at the Geneva Museum. While this locality "Quito" was undoubtedly due to some error, it is by no means clear how the Novara Expedition could have obtained workers of "*marginata* Kirby," a wasp peculiar to Alaska and Labrador. Moreover, de Saussure's description does not quite agree with the boreal form of *norwegica*; he does not mention the rufous spot which is almost always present on the sides of the second tergite in the worker of "*marginata* Kirby." For the foregoing reasons, I prefer to adopt at present the second available name, *albida* Sladen (1918), the identity of which is beyond dispute.

Vespula adulterina (R. du Buysson).—Additional localities: British Columbia: Vernon; Chilcotin; Okanagan Lake; Summerland; Vancouver.—Washington State: Mt. Adams.—Montana: Ravalli Co.

Vespula adulterina var. *arctica* Rohwer.—I have seen specimens from Ontario (Ottawa).

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Migration of Pyrameis cardui.—There has been a great migration of *Pyrameis cardui* this year in the West; the butterflies evidently coming from Mexico. It is difficult to imagine where and how so many millions can have bred. I first saw them, in great numbers, on the east side of the Cuyamaca Mountains, and in the Borego Valley, San Diego County, California. This was early in March. About May 8 they reached Boulder, Colorado, the numbers apparently not diminished.—T. D. A. Cockerell, Boulder, Colo.

NOTES ON THE GENERIC SYNONOMY OF COLLABISMODES CUBAE BOH. (COLEOPTERA: CURCULIONIDAE).

By L. L. Buchanan, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In Florida Entomologist, vol. 18, June, 1934, p. 23, Mr. J. R. Watson reports *Cryptorhynchus cubae* Boh. damaging pepper plants in southern Florida. The species was described from Cuba by Boheman in 1844 (Schon. Gen. et Sp. Curc., VIII, 1, 342), and heretofore was not known from outside the island. Specimens from Florida and Cuba in the United States National Museum show that *cubae* is not a *Cryptorhynchus* but belongs with a group of species to which the generic names *Euxenus, Faustinus, Euxenodes,* and *Collabismodes* have been applied.

Euxenus Faust, 1896 (Stett. Ent. Zeit., vol. 57, p. 47) was erected for 2 Venezuelan species, *posticus* Faust and *apicalis* Faust. *Faustinus* Berg, 1898 (Communicaciones del Mus. Nac. Buenos Aires, Tome I, p. 18) was proposed as a new name for *Euxenus* Faust, preoccupied by *Euxenus* Leconte, 1876, in Anthribidae. *Euxenodes* Bovie, 1907 (Ann. Soc. Ent. Belgique, vol. 51, p. 67) is another and unnecessary new name for *Euxenus* Faust not Leconte.

Champion, 1905 (Biol. Cent. Amer., IV, 4, pp. 494–495), apparently unaware of Berg's *Faustinus,* refers 3 new species from Mexico and Central America to *Euxenus* Faust, and records *E. apicalis* Faust from Nicaragua and Panamá. Champion's allusion to *posticus* Faust as the type of *Euxenus* Faust (*ib.,* p. 494) is here construed as a binding genotype designation.

Collabismodes Champion, 1905 (B. C. A., IV, 4, p. 541), a monobasic genus for *gamma* Champ. Marshall, 1925 (Ann. Mag. Nat. Hist., ser. 9, v. 15, pp. 287–289), considers that the species referred to *Euxenus* by Champion are congeneric with *Collabismodes gamma,* and adopts the latter generic name for a new Brazilian species, *Collabismodes tabaci* Marshall. Specimens of *C. tabaci* in the National Museum collection show that it is very closely related to Boheman's *Cryptorhynchus cubae.* Marshall (*ib.,* p. 289) states that he had not seen *posticus* Faust and, though surmising that this species also will prove to be a *Collabismodes,* cites statements in Faust's description of *Euxenus* that may indicate generic difference between *posticus* and the remaining species. On the assumption, (1), that *posticus* is congeneric with the other species, *Faustinus*

Berg, 1898 (synonyms *Euxenus* Faust, 1896, not Leconte, 1876, *Euxenodes* Bovie, 1907, and *Collabismodes* Champ., 1905) should be used for all the species; or (2), that *posticus* is not congeneric, it will take the name *Faustinus* Berg (Synonyms *Euxenus* Faust not Leconte, and *Euxenodes* Bovie) while *cubae* and the other species may be referred to *Collabismodes.*

The second alternative, as being less likely to cause future nomenclatorial difficulties, is adopted here.

Pin-label biological data on specimens in the National Museum associate *Collabismodes* with solanaceous plants as follows:

tabaci Marshall in tobacco stem (Brazil).

cubae Boh. in pepper stem (Florida) ; and "stem borer in pepper," "bred from eggplant stem," "taken on eggplant" (Cuba).

rhombifer Champ. on tomato and eggplant (Panama).

subparallelus Champ. "in potato stem" (Panama).

Collabismodes sp., an undetermined specimen "in stem of pepper" (Honduras).

Collabismodes cubae Boh. is a conspicuously marked species, 4–4.7 mm. in length, setose and densely scaly, the pronotum blackish and often with vague, gray vittae, the elytra in basal half with an ochreous sutural stripe, behind which is a broad, common, black bar, the apical declivity creamy, the humeral area ochreous to brownish. The erect setae on disk of elytra are unusually broad. The femora are unarmed and the tarsal claws are small and connate at base.

BOOK NOTES.

Field Book of Insects of the United States and Canada. By Frank E. Lutz, Ph.D. (G. P. Putnam's Sons, New York, 1935. Third edition, 510 pp., and about 800 illustrations, many in color.)

This book amply fulfils its title and certainly answers questions about insects in a satisfactory and practical manner. The introduction treats of the names, anatomy and general structure; then follow directions on collecting, rearing, killing, mounting of specimens and the kind of boxes in which they are to be preserved. There is a chapter about spiders, and under "Insects" a short diagnosis of each of the 33 orders into which they are here divided. The numerous illustrations further aid in the matter of determination. On account of the popular interest in butterflies and beetles, much space is devoted to their consideration. Bees and wasps also receive much attention, and there are tables for the determination of many of our ants as well as tables covering many other groups.

As plant galls are caused by mites, and insects of several orders, they are grouped in a chapter by themselves, and illustrated on seven plates. Many galls are so singularly beautiful or curious that they are sure to attract attention, and the student will gain much from this chapter. The twenty-three colored plates are at the end of the volume.

Fifty or seventy-five years ago a book of this kind with its tables and keys, would hardly have received the attention, now accorded it by the ever increasing number of competent nature students who desire and appreciate the accurate "Answers to common questions about insects" to be found in the volume.—Wm. T. Davis.

An important publication not likely to be seen by most entomologists because of its place of publication is that by L. R. Cleveland, **The Wood-feeding Roach Cryptocercus, its Protozoa and Symbiosis between Protozoa and Roach.** Mem. Amer. Acad. of Arts and Sci. 17(No. 2): 185–342 + 60 plates, 1934. The author is responsible for our knowledge of symbiosis between protozoa and termites. This large important work deals with the life history, morphology and protozoan forms of *C. punctulatus.* Morphologically, an important discovery is noted in the following quotation—"The digestion of wood, the sole diet of this insect, is carried out by the protozoa in the colon; but the products which they obtain from the wood cannot be absorbed in this region owing to the fact that it is lined with chitin through which the products cannot pass. Thus, the food which the protozoa supply the roach must be sent to the extraperitrophic space of the mid-gut before it is absorbed, a task that is performed by a special pump and valve." —W. P. Hayes.

PROCEEDINGS OF THE SOCIETY.

Meeting of December 13, 1934.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, December 13, 1934, at 8.10 p. m. President Davis in the chair and eleven other members present, *viz.*, Dr. Tulloch, Messrs. Cleff, Engelhardt, Eisenhardt, Lemmer, Nicolay, Rau, Ragot, Sheridan, Siepmann and Wilford, and Miss Potter, Messrs. Gerberg, Kerrish, and Sherak, and a newspaper reporter.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the report of the Treasurer and spoke of the society's policy regarding the sale of reprints. Mr. Sheridan moved that all matters pertaining to the sale of reprints be left in Mr. Engelhardt's hands, which motion was seconded and carried.

Mr. Siepmann exhibited a copy of "The Families and Genera of North American Diptera," by Dr. C. H. Curran. The book is published by Dr. Curran, and the printing was done by Mr. Ballou, one of the members of the society.

Mr. Engelhardt proposed for membership Dr. George S. Tulloch, Brooklyn College, Brooklyn, N. Y. Dr. Tulloch being present, it was moved and seconded that the by-laws be suspended; a ballot was cast, and Dr. Tulloch was declared elected.

Mr. Engelhardt also proposed for membership Mr. Justus Kaiser, 9429 97th Street, Ozone Park, L. I., N. Y. Further action was deferred until the next meeting.

Mr. William T. Davis read an account of the Black Widow Spider, *Latrodectus mactans,* from "The Science News Letter," and exhibited a few specimens of the species. This spider is known to be poisonous, and has received considerable attention in the newspapers during the past year. It is fairly well distributed in the vicinity of New York City, and every now and then specimens are found. Recently a serum has been made from the blood of rats injected with the venom, which counteracts the effects of the spider's bite.

A general discussion of the Black Widow and its toxic power followed; the question arose whether the bite of the spider is actually potent enough to cause the death of a human being, and after some discussion, it was decided that authentic cases of death from this cause have been reported.

Mr. Eisenhardt exhibited a series of an Asiatic and two European species of *Colias* showing dimorphism, and also other interesting Lepidoptera. *Colias aurora* occurs in Manchuria and other parts of Asia at an altitude of about 3,500 feet. *C. aurora diva* is a rarer local variety, occurring at an altitude of from nine to ten thousand feet. Eight localities are known where *diva* occurs, and in each locality there is a different color form, to which a different varietal name has been given. The males are smaller than typical specimens of *aurora,* and differ in color, but do not differ much among themselves. The females from the eight localities, on the other hand, differ greatly from one another in color and markings. There are more females than males, the ratio, it is said, being about ten to one. Mr. Eisenhardt had an excellent series of six of the eight color forms, and he pointed out their differences as he spoke about them. *Colias edusa* is found all over Europe. *Colias edusa citrina* is a smaller form for which the status of a separate species is sometimes claimed. *Citrina* has five or more different female forms, of which Mr. Eisenhardt showed a series. *Colias myrmidone* is found all over Europe. Both males and females vary; one of the varieties, *isabellina,* is probably the rarest of all *Colias. Colias philodice* has two female forms, a light one and a yellow one like the male. It is called *palaeno* in Europe. In Bohemia there is a variation of this species caled *europome,* which has two female forms, one a greenish yellow in color, one white, the male being bright yellow. Mr. Eisenhardt exhibited a freak obtained by breeding which has both female color forms combined in the one specimen, the left side being white, the right greenish yellow.

Mr. Eisenhardt also showed a black form of a Brazilian Saturnid, *Automeris innoxia.* There is a described melanic form *viridescens,* of which Mr. Eisenhardt had specimens for comparison, which are tan with a greyish tinge; but this specimen was absolutely black, even to the antennae.

Mr. Engelhardt commented upon Mr. Eisenhardt's talk and made a few remarks concerning what the Germans call "Rassenkreise," and the geographical distribution of species.

Mr. Davis appointed a nominating committee to consist of Messrs. Nicolay, Lemmer and Sheridan.

Adjourned at 9.55 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF JANUARY 10, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 10, 1935, at 8.20 p. m. President Davis in the chair and eight other members present, namely, Messrs. Cleff, Engelhardt, Kaiser, Lemmer, Rau, Sheridan, Siepmann, and Dr. Tulloch, and Messrs. Adelmann and Stecher.

The minutes of the previous meeting were read and approved. The Treasurer presented his annual report of 1934, which was ordered placed on file. A general discussion of the magnitude of the work necessary to properly carry out the functions of Treasurer followed. Mr. Sheridan said that the Society, as a note of appreciation of Mr. Engelhardt's work as Treasurer, should show a vote of thanks for what he has done during the past year, to say nothing of the years before. A motion to that effect was made and seconded, and unanimously carried.

Mr. Sheridan, reporting for the Nominating Committee, recommended the reëlection of the existing officers, and proposed that Mr. Wilford serve as Librarian, the office having been left vacant by the death of Mr. Schaeffer. There being no other nominations, a motion was made and seconded, that the officers be elected as nominated, which motion was carried by a unanimous vote.

The proposal that Mr. Justus Kaiser for membership in the society was acted upon, Mr. Kaiser being duly elected.

Mr. William T. Davis exhibited a notebook containing many photographs of insects and other entomological subjects. Among them were pictures of the large ant mounds at Amagansett, Long Island, photographed in September, 1910; a *Lasius niger* nest for coccids, at Lake Hopatcong, N. J.; and the nest of the fungus-growing ant at Wading River. The nest of the latter can be recognized by the half-moon of coarse material thrown up around the outside of the nest. Mr. Davis mentioned that when he first found the nest of this ant at Wading River, it extended the range of this ant about 60 or 70 miles further northward, the most northern locality previously recorded having been the Raritan River. Most interesting of all, perhaps was the photograph of some glow-worms, the larvae of *Phengodes,* which had been produced by placing a photographic plate in contact with the larvae in the dark, who thereby took their own picture.

Mr. Kaiser exhibited a number of interesting Lepidoptera, including *Catocala pura* and its varieties, and *Catocala hermia* and the variety *vesta.* All of the species showed considerable variation, and Mr. Kaiser pointed out the difficulty of distinguishing separate species. The specimens exhibited were all *ex ovo* specimens, in perfect condition and beautifully mounted.

A discussion followed as to whether *Catocalas* in their natural resting position had their heads up or down. It was agreed that they rest with their heads down, although when disturbed will often alight with their heads up, only to reverse themselves shortly after. Mr. Lemmer added that *amica* and *parta* were exceptions, resting with their heads up.

Mr. Engelhardt spoke on the subject of "Rassenkreise of North American *Aegeriidae*." He remarked that the German term, Rassenkreise, expresses more precisely and concisely than any other language, what may be called a biological unit, composed of species, sub-species or whatever rank we care to apply, all conforming strictly in structural characters, but may differ strikingly in coloration and in size. Taxonomic studies, supplemented by careful investigation as to habits and distribution, have proven that such an assemblage can be readily connected with one original source and the deviations assigned to the influence of climatic changes within the range of such biological units.

None of the many fields of zoological research offer better opportunities for such investigations than entomology. Mr. Engelhardt's own studies of the *Aegeriidae* or clearwing moths may serve as an example. This family, world wide in distribution, is represented on the North American continent by about 150 species. All of these, in the larval stage, are borers in living plants and, with few exceptions, borers in some particular plant and in a particular part of that plant.

With these facts in mind and as far as foodplants and habits are known it has been possible to obtain, largely by breeding, long series of North American indigenous species, from widely separated regions. These show interesting and often surprising results.

Some species display no appreciable differences throughout a distribution from coast to coast; others vary from dark brown in the east to tan color in the west, and still others run to extremes, which would obscure their relationship could they not be connected by intermediate forms. The effect of environment appears to be expressed most strongly in the warm, humid climate of the south and in the hot, dry desert climate of the west. Variations in the Hudsonian and Canadian zones are far less striking.

A selection of species, arranged to show their geographical distribution and their response to changes in environment, illustrated Mr. Engelhardt's remarks.

Adjourned at 10.10 p. m.

CARL GEO. SIEPMANN,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. 5 sizes type. 3½ point, 75c per 1000. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

WILL COLLECT for cash all ORDERS OF INSECTS, providing I receive sufficient orders prior to collecting to justify my proceeding. Have many specimens in stock at all times for sale. Louise Knobel, Hope, Arkansas.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, 688 Nye Ave., Irvington, N. J.

Vol. XXX OCTOBER, 1935 No. 4

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BROOKLYN ENTOMOLOGICAL SOCIETY

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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXX October, 1935 No. 4

NEW COLLEMBOLA FROM WESTERN NORTH AMERICA.

By Harlow B. Mills.

A number of collections of insects belonging to the Order Collembola which were taken in the western states have come to my attention recently. The present paper includes the results of an examination of a part of these collections, in which are described eight new species, seven belonging to the Suborder Arthropleona, and the eighth to the Suborder Symphypleona.

The new species are:

Onychiurus oreadis n. sp.
Folsomides decemoculatus n. sp.
Drepanura rolfsi n. sp.
Entomobrya washingtonia n. sp.
Entomobrya frontalis n. sp.
Entomobrya tampicensis n. sp.
Sinella quadrioculata n. sp.
Neosminthurus occidentalis n. sp.

Onychiurus oreadis n. sp.

White. Postantennal organ of 14 or 15 compound tubercles of the *ramosus* type. Antennae subequal to the head, the segments about as 5:9:8:14. Sense organ of the 3rd antennal segment with 2 granular, nearly round sense clubs, 2 sense rods, 5 papillae, and 5 guard setae. The 4th segment bears several olfactory hairs and a subapical sense pit. Unguis curving, without teeth. Unguiculus 2/3 to 3/4 the unguis, with a definite basal lamella and an acicular apex. Furcula absent. Anal horns 2, somewhat curving, to the hind unguis as 8:13. Dorsal pseudocelli on either side as follows: 3 on the antennal base; posterior margin of the head 2; pronotum 1; mesonotum 2, separated, one lateral; metanotum 2, separated, one lateral; 1st abdominal segment 3; 2nd abdominal segment 3; 3rd abdominal segment 3; 4th abdominal segment 3, one lateral, the others close together and subdorsal; 5th

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abdominal segment 3. Body hairs rather long. Length 1.3 mm.

This species is apparently close to *O. congugens* C. B. of Japan. It was collected on Mt. Rainier, Mt. Rainier National Park, Washington, by Archie R. Rolfs, at an elevation of 6,000 ft.

Folsomides decemoculatus n. sp. Figs. 1, 2.

White but for the 5 eyes on either side of the head, each of which lies in a separate black eye spot, the anterior ones often coalescing (fig. 1). Postantennal organ elliptical, constricted at the middle, about half as long as the width of the antennal base, protected by 3 guard setae. Antennae shorter than the head, about as 48: 59, the segments about as 17: 22: 23: 37. Unguis slender, curving apically, unarmed. Unguiculus apically acuminate, half the unguis on the first 2 pairs of legs and about 2/3 the unguis on the posterior feet. Manubrium to dentes to mucrones as 37: 18: 6, the manubrium not tapering, with about 8 dorsal setae. Dentes with 3 dorsal setae and an external one ventrally near the apex, tapering into the mucrones. Mucrones (fig. 2) 2-toothed, the apical tooth small, upturned, the anteapical tooth pointing slightly anteriorly; separated from the dentes. Furcula reaching beyond the posterior margin of the 3rd abdominal segment. Rami of the tenaculum 4-toothed, the corpus with one anterior seta. Body hairs of medium length, longer on the 5th and 6th abdominal segments. First antennal segment with a single row of hairs. Integument very finely granulate. Sense organs of the 3rd antennal segment composed of 2 rods in deep pits. Several curving olfactory hairs interspersed among the longer tactile ones of the 4th segment. Body divisions from the head to the 6th abdominal segment about as 29: 8: 17: 15: 11: 13: 11: 13:-9: 6. Length .84 mm.

The tip of the abdomen is bent slightly downward, rather than directed posteriorly as in the other species of the genus, and is more rounding. The segments are definite and annular, however, and there is no doubt as to the generic identity of the species.

I am indebted to Dr. D. E. Beck, of St. George, Utah, for this interesting and unique species, which was taken from moss collected from the north side of a boulder, in a semiarid situation. It was collected in April, 1933, St. George, Utah.

Drepanura rolfsi n. sp. Fig. 3.

Color in alcohol pale yellow with blue pigment. Pronotum with some dorsal pigment. Mesonotum with a narrow blue

> line completely around it or broken laterally on the posterior margin. Metanotum with narrow lateral and posterior lines. First abdominal segment with narrow lateral and posterior lines, 2nd with posterior margin pigmented, 3rd with posterior margin pigmented, 4th pigmented dorsally on the posterior margin, 5th pigmentless or with a minute dark spot dorsally on the posterior midline, 6th with no pigment. All bands may be narrowly broken on the dorsal midline. Antennae purple, darker apically. Eyespots black, connected through the antennal bases by a dark line. Shade of pigment usually posterior to the eyespots. An inverted V on the front, connecting the inner proximal corners of the eyespots. A dark area dorsally in the occipital region, and laterally behind the eyespots. Legs with diffuse pigment which may consolidate into obscure bands on the tibiotarsi. Furcula colorless. Eyes 8 on either side, the 2 inner proximals smaller than the rest. Head to the antennae as 6: 11, the antennal segments about as 7: 16:-13: 18. Unguis nearly straight, with 2 pairs of inner teeth beyond the middle. Unguiculus lanceolate. Manubrium to dentes as 2: 3. Mucro (fig. 3) weakly falcate; I have been unable to discover a basal spine. Third abdominal segment to the 4th about as 1 : 5. Length 1.5 mm.

In Bonet's key to the group (Revista Española de Entomologia, IX, pp. 155–157, May, 1934) this form approaches the Australian species *D. coeruleopicta* Schött, from which it differs in the pigmentation of the mesothorax and the 4th abdominal segment.

This species is named for its collector, Mr. A. R. Rolfs, whose assiduousness has brought to light this and many other interesting Collembola. It was taken at Yakima, Washington, under trash, November 25, 1931.

Entomobrya washingtonia n. sp. Figs. 4, 13.

> Body yellow-white with blue-black pigment. First antennal segment with an apical ring, and shaded with blue inwardly, 2nd segment blue but for the base, 3rd and 4th blue, lighter basally. Head and body pigment as in fig. 13. Antennal bases connected by a dark line, genae shaded with pigment, and a chevron on the vertex. Mesonotum pigmented laterally, usually with a postero-dorsal spot which may be divided on the midline. Metanotum pigmented laterally and posteriorly, the posterior line broken laterally. First abdominal segment colored as the metanotum. Second segment broadly colored laterally and with an unbroken posterior band. Third segment with irregular pigment laterally, and with an irregular poste-

rior band. Fourth segment with broad lateral lines and an irregular median dorsal line, none of the 3 lines reaching the anterior border of the segment. Fifth and 6th segments pigmented laterally, the 6th almost completely dark. Precoxae blue outwardly, femora blue toward the apex, tibiotarsus with a band near the middle. Furcula unpigmented. Eyes 8 on either side on black eyepatches. Unguis nearly straight, with 3 pairs of inner teeth beyond the middle, a pair of lateral teeth and an external one near the base. Unguiculus 2/3 the unguis, lanceolate. Tenent hair slightly longer than the unguis. Head to the antennae as 25 : 68, the antennal segments about as 11 : 18 : 17 : 22. Fourth abdominal segment about 5 times the 3rd. Manubrium to the dentes as 2 : 3. Mucro normal (fig. 4) with 2 teeth and a basal spine, about 1/3 the bare area of the dens. Length 1.6 mm.

Collected from beneath leaves at Yakima, Washington, September 6, 1931, by Archie R. Rolfs.

Entomobrya frontalis n. sp. Figs. 5, 6.

Body pale yellow with minute ferruginous spots, pigment blue-black. Body occasionally with a brownish tint. Eyespots black, a broad blue-black band connecting them through the antennal bases. A blue chevron on the vertex, the points of which diverge toward the inner posterior corners of the eyespots. Antennae rather heavy, grading from light at the base to dark at the apex, the pigment darker apically on each segment, usually forming a definite ring and an indefinite line on either side of the first segment. The 5th segment of the abdomen usually with some pigment dorsally, sometimes forming a fairly definite band, occasionally absent. The last two thoracic segments and the first 4 abdominal segments with a concentration of brownish pigment along the posterior borders. Legs pale yellow-brown. Furcula colorless. Antennae to the head as 49 : 23, the segments about as 12 : 25 : 24 : 33. Eyes 8 on either side, the 2 inner proximals small, and the 2 anterior ones somewhat larger than the rest. The 4th abdominal segment 5 or 6 times the 3rd. Unguis (fig. 5) rather broad, with 3 pairs of small inner teeth beyond the middle, a pair of lateral teeth a third from the base, and a minute external tooth half way to the apex. Unguiculus broadly lanceolate. Tenent hair subequal to the unguis. Manubrium to dentes as 20 : 27. Mucro normal (fig. 6), the bare apex 3½ times the mucro. Length 1.5 mm.

Taken beneath rocks and humus at Lake Tipsoe, Washington, 5,400 feet elevation, October 11, 1931, by Archie R. Rolfs.

Entomobrya tampicensis n. sp. Figs. 7, 14–17.

> Body yellow-white with blue-black pigment. Antennae with the 1st segment light basally, pigment forming a ring apically, 2nd segment light basally and dark apically, 3rd and 4th segments dark. Body coloration variable, as in figures 14–17, inclusive. In dark specimens the antennae and legs are entirely dark. Eyes 8 on either side, the two inner proximals on each side smaller. Antennae twice the length of the head, the segments about as 9: 18: 17: 21. Fourth abdominal segment 4 to 5 times the 3rd. Unguis (fig. 7) nearly straight, with 3 pairs of inner teeth, a pair of lateral ones near the middle, and an external one between them. Unguiculus 2/3 the unguis, lanceolate, the outer edge feathered. Dentes 2 times the manubrium. Mucrones typical, with 2 teeth and a basal spine, less than 1/3 the length of the bare dental apex. Length 1.5 mm.

This species resembles in one color phase *E. triangularis* Schött. It is, however, a smaller, more compact species, of different ungual dentition, and of different proportions.

Tampico, Washington, April 15, 1932, Archie R. Rolfs.

Sinella quadrioculata n. sp. Figs. 8, 9.

> White but for black eyepatches and scattered black pigment on the head. Eyes 2 on either side, close together, nearly equidistant from the antennal base (fig. 8). Antennae to the head approximately as 50: 33, the segments about as 6: 16: 11: 19. Unguis (fig. 9) with 3 inner teeth, 2 lateral ones, and an external one midway between the base and the apex. Unguiculus about 2/3 the unguis, weakly fringed on the outer border. Tenent hair reduced, shorter than the unguis. Tibiotarsi with the usual rows of smooth hairs. Third and 4th abdominal segments as 1: 3. Manubrium to dentes as 2: 3, the mucro to the smooth (finely crenulate) apex of the dens as 1: 7. Mucro entomobryiform, with 2 teeth and a basal spine. Body hairs of the usual shape, the smaller, reclinate hairs of the body plumose. Scales absent. Length 1.7 mm.

Sinella curviseta Brook has 2 eyes on either side also, but they are placed longitudinally instead of transversely of the head as in this new species. One cannot help but be struck by the similarity between the eye position of this species and the one described by Schött from California as *Templetonia quadrioculata.* He shows 5 antennal segments though, and *Heteromurus* (= *Templetonia*) is a scaled genus.

Tampico, Washington, April 15, 1932, Archie R. Rolfs.

Neosminthurus occidentalis n. sp. Figs. 10, 12.

Body with a blue-black background, irregularly mottled with pearl, lilac, and rose. Oral region dark, the cheek and frons generally white but for some maculation on the frons. Frontal ocellus black. Vertex and occipital region colored laterally. Pigment is present from the antennal bases to the front of the eyespots. A narrow dorsal midline may be seen on the anterior half of the body. Anal papilla light dorsally, dark ventrally. Antennae blue-black, with a brownish cast basally. Legs irregularly blue, lighter above the tibiotarsus. Furcula dusky, lighter at the insertion. Eyes 8 on either side, on black eyespots. Antennae about 1.5 times the head, the segments about as 4: 12; 11: 15; the base of the 1st segment with an outer apical swelling, the 2nd segment with an outer basal double papilla. Unguis tunicate, unidentate, with large lateral toothed pseudonychiae. Unguiculus (fig. 10) broad, the apex acuminate, with the subapical bristle greatly expanded. Proximal precoxal process of the midlegs (fig. 11) with an irregular capitate process. Furcula similar to that of *N. longisetis* (Guthrie), the mucro, however (fig. 12), with the inner margin strongly but roundly toothed and the outer minutely roughened. The short hairs of the dentes fringed somewhat as in the case of the genus *Ptenothrix*. Sacs of the ventral tube 3 times the length of the tube, smooth or coarsely corrugate. Body hairs as in *N. longisetis,* long, fringed, truncate and serrate apically; the large hairs extend onto the first 2 antennal segments. Body with 3 pairs of bothriotricha, the 5th abdominal segment with 1 pair. Two papillae between the eyespots. Integument tuberculate. Length up to 2 mm.

This is without doubt the most beautiful entomological gem which it has been my privilege to examine. From the beautiful, highly colored, sometimes irridescent, animated spectrum described above, the species varies, possibly in the younger specimens, to a more buff cast, but in all specimens examined the mosaic work was evident.

This species is most closely related to *Neosminthurus longisetis* (Guthrie), a type of which I have examined, and from which it differs in the following respects:

Longisetis	*Occidentalis*
Brown-black, indistinctly mottled with yellow.	Color as above.

Eyespots dusky yellow.	Eyespots black.
Unguiculus with a slender simple hair.	Unguiculus with a broadly expanded hair.
Inner mucronal edge weakly toothed.	Inner mucronal edge strongly toothed.

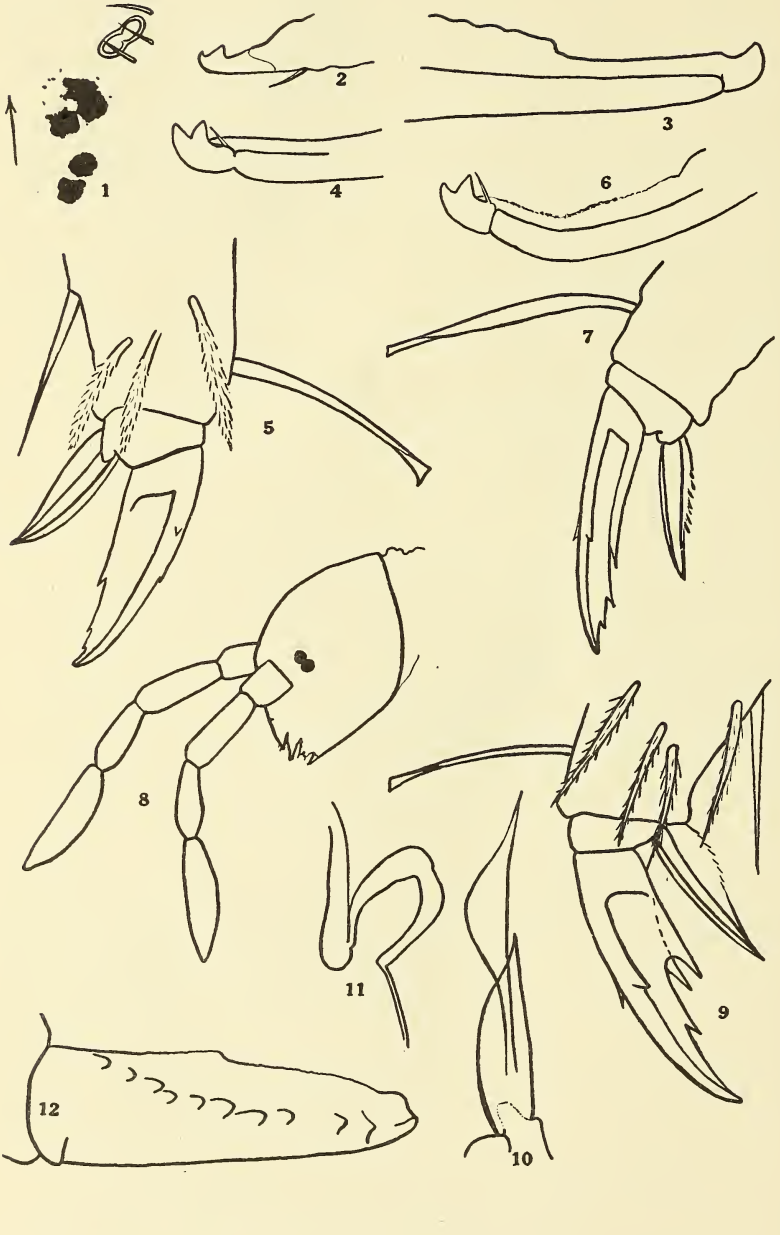
Taken from moss. Puyallup, Washington, December, 1931, and January, 1932, W. W. Baker (received from Archie R. Rolfs).

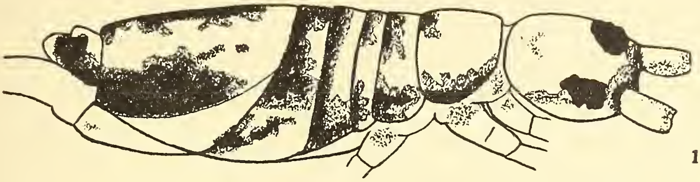
Explanation of Plate IV.

Folsomides decemoculatus n. sp.
 1. Right eyes.
 2. Right mucro.
Drepanura rolfsi n. sp.
 3. Left mucro.
Entomobrya washingtonia n. sp.
 4. Right mucro.
Entomobrya frontalis n. sp.
 5. Right hind foot.
 6. Right mucro.
Entomobrya tampicensis n. sp.
 7. Left fore foot.
Sinella quadrioculata n. sp.
 8. Left view of head.
 9. Left fore foot.
Neosminthurus occidentalis n. sp.
 10. Unguiculus from left hind foot.
 11. Proximal precoxal process of left midleg.
 12. Right mucro.

Explanation of Plate V.

Entomobrya washingtonia n. sp.
 13. Right view of body.
Entomobrya tampicensis n. sp.
 14 to 17, inc. Color variations of head and body.

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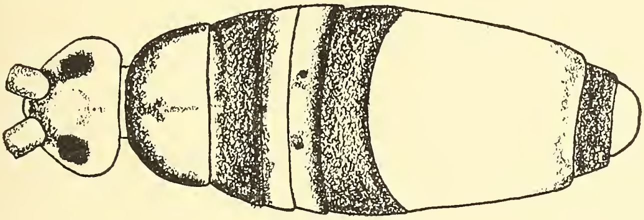
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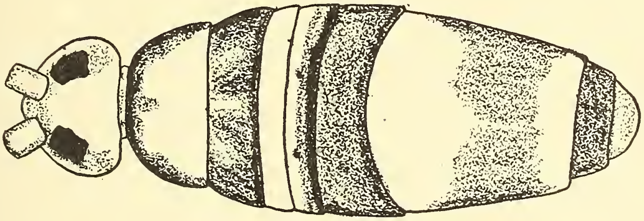
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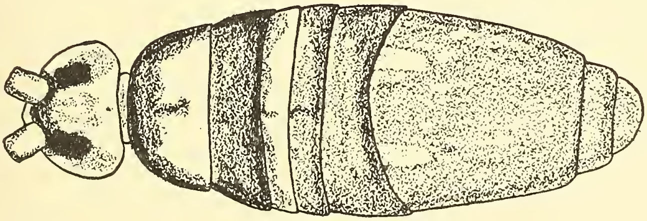
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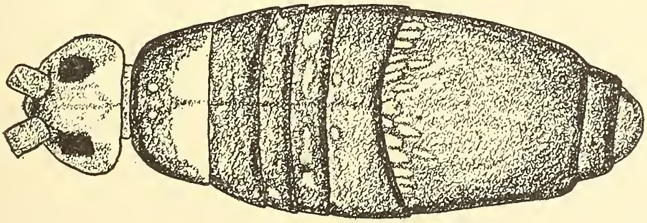
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A SUPPLEMENT TO THE SECTION OF THE NEW YORK STATE LIST OF INSECTS DEVOTED TO COLEOPTERA. ADDITIONS, NOTES AND CORRECTIONS.[1]

By Kenneth W. Cooper, Department of Zoology, Columbia University, New York City, N. Y.

It is now scarcely seven years since the date of issue of the New York State List of Insects,[2] yet the list of Coleoptera there contained has already received additions numbering in the hundreds. For the most part these records are scattered in an unorganized manner through a number of papers and the proceedings of the New York and Brooklyn Entomological Societies. A preponderance of the supplementary additions have been of Long Island captures, yet it is important that all records of Long Island insects be published for the increasing population is fast making serious inroads on all the remaining wild tracts of land. Within the past few years Flushing, for example, has expanded enormously, and with its expansion has crowded out a large measure of its wild life. Insects will probably never be totally excluded from a man-made community, but it is equally certain that numerous species rigidly adapted to an environment definitely objectionable to man will be stamped out.

It is the purpose of this paper not only to add to the recorded fauna of Long Island and the State, but an attempt has been made to bring together in bibliographical form all those records of New York Coleoptera extant in the current literature but not listed in the Cornell Agricultural Experiment Station Memoir. The literature list contains only the first published records for species added to the New York State List.

In order that the bibliography be serviceable, references will be found under each family title to papers including species of the family. At the close of the reference a short note summarizes the information contained in the paper, and in most cases actual inquiry to the original source will be found unnecessary. Despite possible inadequacy of the list of literature cited, it is to be hoped that use of this bibliography will in the future prevent continual reduplication of records which are already published.

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[1] Received for publication April 24, 1935.

[2] Cornell Univ. Agr. Exp. Sta., Mem. 101, Aug., 1926 (issued January, 1928.)

The list of additions is in part descriptive of the late Mr. Schaeffer's labors on the Weeks and Martin collections of Coleoptera which were some time ago bequeathed the Brooklyn Museum of Arts and Sciences. Mr. Schaeffer very kindly suggested the inclusion of these records within this paper, and not only turned over records of his own collecting but numerous notes as well.

As usual, the numbers preceding the generic and specific names are those of the Leng catalog. A double asterisk (**) preceding the catalog number indicates that the species is new to the New York State List of Insects; a single asterisk (*) signifies that the addition supplies the first record for New York exclusive of Staten and/or Long Islands; a dagger (†) precedes records new to Staten Island, and a double dagger (‡) species new to the recorded fauna of Long Island. Those species for which the records of the New York State List of Insects have failed to supply definite localities (the locality being merely "NY", "SI", or "LI") have been considered worthy of record whenever data were at hand. For this reason such species as *Silpha lapponica* Hbst., *Agathidium oniscoides* Beauv., and *A. exiguum* Melsh., etc., have been included within the list.

Following the record of capture the abbreviated name of the determiner will be found in parentheses. Names in *italics* are those of the collectors—if both in *italics* and parentheses, the same individual is collector and taxonomist. The customary abbreviations have been resorted to throughout the list, viz.—M. W. Blackman, Blkm; L. L. Buchanan, Buch; Chas. A. Schaeffer, Sf. Two cooperators are also mentioned, the Brooklyn Museum (BM) and the New York State Museum (NYS). Determination records to be attributed to the author are indicated by the initial "C".

CICINDELIDAE.

(Angell 1931; Nicolay and Weiss 1932.)

CARABIDAE.

(Cooper 1930, 1932b; Davis 1926; Hatch 1933b; Nicolay and Weiss 1934; Notman 1929; Shoemaker 1930.)

†182 *Calosoma sycophanta* L. SI: *Davis* (Sf).

‡222 *Elaphrus clairvillei* Kby. LI: Flushing, Jul, *Cooper* (Sf, *C*).

302 *Pasimachus sublaevis* Beauv. The typical *sublaevis* does not occur within the limits of New York State; the New York State List records under this name

must be referred to *Pasimachus sublaevis* variety *subtriatus* Hald. Sf&C.

355 *Dyschirius hispidus* Lec. The single New York record in the List for this species should be referred to *Dyschirius setosus* Lec. Sf.

**374 *Clivina convexa* Lec. LI: Rockaway Beach and Long Beach, *O. Dietz* (Sf).

‡829 *Tachyura tripunctata* Say. LI: Yaphank, Ap, *Engelhardt* (Sf).

‡834 *T. ferrugineus* Dej. LI: Rockaway Beach, May, *Shoemaker* (Sf).

**866 *Tachys lituralis* Csy. LI: Rockaway Beach, *Cooper* (Sf).

929 *Myas coracinus* Say. "LI" must be inserted before "Montauk".

1173 *Melanius* (see Hatch 1933b) *ebeninus* Dej. (See Nicolay & Weiss 1934.) This species should immediately precede *M. caudicalis* in the List.

‡1444 *Rembus obtusus* Lec. LI: Long Beach, Mar, *Schott* (Sf).

**1602 *Pengona pallipennis* Lec. SI: Ap, *Weeks* (Sf).

†1609 *Atranus pubescens* Dej. SI: *Weeks* (Sf).

1646 *Lebia atriceps* Lec. Recorded from Mosholu (NYS) in the New York State List, but is apparently a misdetermined species. *Atriceps* is a common western species and should be omitted from the List. Sf&C.

—— *L. esurialis* Csy. This record should be referred to *L. canonica* Csy. Sf.

‡1907 *Harpalus vagans* Lec. LI: Flushing (*C*).

HALIPIDAE.

‡2317 *Haliplus borealis* Lec. LI: Flushing, Aug (*C*).

DYTISCIDAE.

(Cooper 1932b.)

GYRINIDAE.

(Ochs 1930.)

HYDROPHILIDAE.

(Cooper 1930, 1932b.)

‡2810 *Hydrobius globosus* Say. LI: Bayside, among dead leaves in running spring, Ap 8, *Lipsey* and *Cooper* (*C*); Flushing (*C*).

‡2852 *Cymbiodita lacustris* Lec. LI: Bayside, taken with the above species, Ap 8, *Lipsey* and *Cooper* (*C*).

SILPHIDAE.

(Cooper 1932b; Hatch 1928b, 1933a.)

2923 *Silpha lapponica* Hbst. LI: Flushing, Ap (*C*).
3029 *Agathidium oniscoides* Beauv. LI: Bayside, Nov, under bark (*C*); Southold (*C*).
3030 *A. exiguum* Melsh. LI: Flushing, Aug, in decaying fungus (*C*).

SCYDMAENIDAE.

(Cooper 1932b.)

ORTHOPERIDAE.

(Cooper, 1930, 1932b.)

STAPHYLINIDAE.

(Casey 1905; Cooper 1930, 1932b.)

‡3355 *Pycnoglypta lurida* Gyll. LI: Flushing (*C*).
‡3379 *Omalium humerosum* Fauv. LI: Flushing (*C*).
‡3556 *Apocellus sphaericollis* Say. LI: Flushing (*C*).
3914 *Gastrolobium parallelum* Csy. LI: Rockaway Beach, Aug, *Engelhardt* (Sf).
3952 *Paederus littorarius* Grav. LI: Flushing, Mar-Sep (*C*); Bayside (*C*); Whitestone (*C*).
3969 *Lathrobium nigrolucens* Csy. LI: Jamaica, *Pearsall* (Sf).
‡4022 *Tetartopeus angularis* Lec. LI: Wyandanch (*Sf*).
‡4094 *Lithocharis ochracea* Grav. LI: Cold Spring Harbor (*Sf*).
**4238 *Stilicus opaculus* Lec. LI: Cold Spring Harbor (*Sf*).
‡4285 *Nudobius cephalus* Say. LI: Flushing (*C*).
*4312 *Gyrohypnus sanguinipennis* Lec. Pelham (*C*).
‡4334 *Nematolinus longicollis* Lec. LI: Flushing (*C*).
‡4361 *Neobisnius sobrinus* Er. LI: Flushing (*C*).
4362 *N. agnatus* Er. The single record for this species in the New York State List should be referred to *sobrinus* Er. Sf.
4396 *Philonthus fuscipennis* Mann. Darts, Aug, at carrion (*C*).
‡4418 *P. quadricollis* Horn. LI: Southold and Flushing (*C*).
**4429 *P. thoracicus* Grav. LI: *O. Dietz* (Sf).

‡4441 *P. micans* Grav. LI: Flushing (*C*); Bayside (*C*); Whitestone (*C*).

‡4445 *P. aequalis* Horn. LI: Flushing (*C*).

**4449 *P. quediinus* Horn. LI: Flatbush, Ap, *Dow* (Sf).

*4554 *Tympanophorus puncticollis* Er. Darts, Aug, under carrion (*C*).

4586 *Quedius capucinus* Grav. Darts, Aug, under carrion (*C*).

‡4595 *Q. peregrinus* Grav. LI: Flushing (*C*).

4639 *Oxyporus lepidus* Lec. Yonkers, Je, *Dow* (*Sf*).

4679 *Tachyporus elegans* Horn. LI: Brooklyn, *Dow* (Sf); Jamaica, *Pearsall* (Sf); Flushing (*C*).

‡4697 *Conosoma opicus* Say. LI: Central Park, *Engelhardt* (Sf); Flatbush, *Weeks* (Sf); Bayside (*C*); Flushing (*C*).

‡4729 *Bolitobius obsoletus* Say. LI: Bellport, Jul, *Nicolay* (Sf).

**4730a *B. cinctus gentilis* Lec. LI: Pinelawn, Oct, *Engelhardt* (Sf).

**4736 *Bryoporus flavipes* Lec. LI: *O. Dietz* (Sf).

‡4742a *Mycetoporus americanus lucidulus* Lec. LI: *Shoemaker* (Sf).

‡4743 *M. flavicollis pictus* Horn. LI: Aqueduct, May (BM); Forest Park, *Pearsall* (Sf); Flushing (*C*).

‡4744 *M. splendidus* Grav. LI: *Shoemaker* (Sf); Wyandanch (*Sf*).

‡5473 *Amischa analis* Grav. LI: Flushing (*C*).

‡5820 *Baryodma nitida* Grav. LI: Flushing (*C*).

PSELAPHIDAE.

(Cooper 1932b; Nicolay 1925.)

6247 *Brachygluta luniger* Lec. LI: Rockaway Beach, May 24, *Shoemaker* (Sf); Long Beach, May (*C*); Engelhardt (Sf).

*6374 *Ceophyllus monilis* Lec. Mosholu (*Sf*). Previously recorded from Long Island by Cooper (1932b).

PTILIIDAE.

(Burke, 1931; Cooper 1932a, 1932b.)

SCAPHIDIIDAE.

(Belkin, 1933; Cooper 1932b.)

HISTERIDAE.

(Belkin 1933; Cooper 1930, 1932b.)

6646 *Teretrius latebricola* Lew. Catskill Mts., Je, Pearsall (Sf).

6685 *Psiloscelis incurva* Csy. Westchester Co. (Sf). In the estimation of the author this form should be included under *Psiloscelis harrisi* as a synonym. Mr. Chas. A. Ballou, student of the Histeridae, believes that "although types have not been compared, it is most probable that this species (*incurva*) is synonymous with *Psiloscelis harrisi* Lec."

LYCIDAE.

(Belkin 1933.)

6925 *Calopteron terminale* Say. LI: Flatbush, *Ballou* (C); Flushing (*C*).

LAMPYRIDAE.

(Belkin 1933; Cooper 1930; Fall 1927.)

6971 *Lucidota atra* Fab. "LI" should be inserted before Jamaica.

‡6979 *L. decipiens* Harr. LI: Flushing (*C*).

CANTHARIDAE.

(Belkin 1933; Cooper 1930.)

‡7062 *Podabrus modestus* Say. LI: Flushing (*C*).

‡7097 *Cantharis carolinus* Fab. LI: Flushing (*C*).

‡—— *Malthodes* sp. LI: Southold, Aug (*C*).

MELYRIDAE.

(Belkin 1933; Cooper 1932b).

CLERIDAE.

(Cooper 1932b; Knull 1930.)

†7566 *Cymatodera undulata* Say. SI: Aug, *Weeks* (Sf).

‡7577 *Priocera castanea* Newn. LI: Yaphank, Jul, *Weeks* (Sf).

†7711 *Corinthiscus leucophaeum* Klug. SI: Jul, *Weeks* (Sf).

MICROMALTHIDAE.

(Cooper 1934.)

MORDELLIDAE.

(Belkin 1933; Cooper 1932b.)

MELOIDAE.

(Chittenden 1926; Cooper 1930.)

**8183 *Nemognatha cribraria* Lec. LI: Yaphank (*Sf*); East Islip, *Siepmann* (C).

‡8194 *Tricrania sanguinipennis* Say. LI: Woodside, *Martin* (Sf).

PYTHIDAE.

‡8215 *Rhinosimus viridiaeneus* Rand. LI: Parkville, Jul, *Weeks* (Sf).

ANTHICIDAE.

(Cooper 1930, 1932b.)

EUGLENIDAE.

(Cooper 1932b.)

ELATERIDAE.

(Cooper 1930, 1932b; Davis 1932b; Fall 1934.)

‡8855 *Melanactes morio* Fab. LI: Flushing (*C*).

—— *Elater longipennis* Not. Page 351:—omit; previously recorded on page 350.

MELASIDAE.

(Cooper 1932b.)

†‡9141 *Dromaeolus striatus* Lec. SI: Jul, *Weeks* (Sf); LI: Yaphank, Jul, *Weeks* (Sf).

‡9143 *D. cylindricollis* Say. LI: Yaphank, Jul-Aug, *Weeks* (Sf).

**9146 *Fornax badius* Melsh. SI: Jul, *Weeks* (Sf).

BUPRESTIDAE.

(Cooper 1930, 1932b; Davis 1932b; Fisher 1928.)

HELODIDAE.

(Cooper 1932b.)

—— *Cyphon* n. sp. = *Cyphon cooperi* Schffr. Bull. B'klyn Ent. Soc. 26(4): 174, Oct. 1931.

DERMESTIDAE.

(Cooper 1932b; Schaeffer 1930.)

BYRRHIDAE.

(Cooper 1930.)

‡9869 *Byrrhus americanus* Lec. LI: Northport (*C*); Rockaway Beach (*C*).

OSTOMIDAE.

‡9984 *Tenebroides bimaculatus* Melsh. LI: Huntington, Sep, *Schott* (Sf).

‡9989 *T. collaris* Sturm. LI: Wyandanch, Ap, *Schott* (Sf).

NITIDULIDAE.

(Belkin 1933; Cooper 1930, 1932b; Hatch 1928a; Lacey 1933; Siepmann 1927, 1932.)

‡10031 *Colopterus unicolor* Say. LI: Wyandanch (*Sf*); Flushing (*C*).

‡10106 *Soronia guttulata* Lec. LI: Flushing, Je, at sap of dying gum tree (*C*).

‡10121 *Cyllodes biplagiatus* Lec. LI: Flushing, Je, at sap of dying gum tree (*C*).

**10142 *Cybocephalus nigritulus* Lec. LI: *Engelhardt* (Sf).

RHIZOPHAGIDAE.

(Cooper 1930.)

MONOTOMIDAE.

(Cooper 1930.)

CUCUJIDAE.

(Belkin 1933; Cooper 1930, 1932b.)

**10195 *Oryzaephilus bicornis* Er. LI: Brooklyn (*Sf*); Maspeth, *Olsen* (Sf); Flatbush, *Ballou* (C); Flushing (*C*); Whitestone, *Bowdoin* (C).

**10265 *Lathropus vernalis* Lec. LI: East New York, Je, *Weeks* (Sf).

EROTYLIDAE.

(Cooper 1930, 1932b).

DERODONTIDAE.

(Cooper 1930.)

CRYPTOPHAGIDAE.

(Cooper 1930, 1932b.)

**10372 *Antherophagus convexus* Lec. Maplecrest, Catskill Mts., Je, from the nest of a bee in log, *Schott* (Sf).

MYCETOPHAGIDAE.

(Belkin 1933; Cooper 1932b.)

COLYDIIDAE.

(Cooper 1930, 1932b; Lacey 1933.)

‡10592 *Bothrideres geminatus* Say. LI: Flatbush, May, *Weeks* (Sf); *Ballou* (C).

10601 *Cerylon sticticum* Csy. The record "Catskill, *Pears* (Sf)" should precede "SI."

LATHRIDIIDAE.

(Cooper 1930, 1932b.)

ENDOMYCHIDAE.

‡10727 *Mycetina perpulchra* Newn. LI: Yaphank, Aug, *Weeks* (Sf).

**10—— *Symbiotes* sp. (novum?). LI: Flushing (*C*).

COCCINELLIDAE.

(Cooper 1930, 1932b; Davis 1932a, 1933; Lacey 1932a, 1932b; Shoemaker 1929a.)

10874 *Hyperaspis lateralis* Muls. Buffalo (Z&R). This record is probably in error, and should be omitted from the List unless verified; the species is a western form. (Sf, C).

**10946 *H. lewisi* Lec. Bear Mt., Jul, *Schott* (Sf).

‡10989 *Microweisea misella* Lec. LI: Yaphank, Jul, *Davis* (Sf); Aqueduct, Jul, *Weeks* (Sf); Southold, Jul, *Cooper* (Sf, *C*).

‡11011a *Scymnus creperus fraternus* Lec. LI: Flushing (*C*).

‡11055 *S. tenebrosus* Muls. LI: Yaphank (*Sf*); Flushing (*C*).

‡11082 *S. americanus* Muls. LI: Southold (*C*); Flushing (*C*).

‡11093a *S. flavifrons bioculatus* Muls. LI: Yaphank (*Sf*).

**11104 *S. intrusus* Horn. LI: Wyandanch, Aug, *Barber* (Chapin).

**11112 *S. myrmedon* Muls. LI: Wading River, Jul (*Sf*).

**11114 *S. liebecki* Horn. LI: Pinelawn, Aug (*Sf*).

**11193– *Adalia bipunctata bioculata* Say. LI: Flushing (*C*).

**11193– *A. bipunctata unifasciata* Fab. LI: Flushing (*C*).

‡11231 *Epilachna corrupta* Muls. LI: Babylon (Felt); Huntington (Felt); Westbury (Felt); Flushing (*C*); Southold (*C*); Whitestone (*C*); Bayside (*C*); Fire Island, *Ballou* (C); Jackson Heights (*C*).

ALLECULIDAE.

‡11321 *Mycetochara haldemani* Lec. LI: Flushing, Je, *Cooper* (Sf, *C*).

TENEBRIONIDAE.

(Cooper 1930.)

12188 *Opatrinus minimus* Beauv. LI: Flushing, Mar (*C*).

‡12318 *Platydema ruficorne* Sturm. LI: Flushing (*C*).

**12139 *P. flavipes* Fab. LI: Flushing, in company with the preceding (*C*).

†12393 *Haplandrus ater* Lec. SI: Mar, *Weeks* (Sf).

LAGRIIDAE.

**12504 *Statira resplendens* Melsh. LI: Parkville, Je, *Weeks* (Sf).

MELANDRYIDAE.

(Belkin 1933; Cooper 1932b.)

‡12550 *Prothalpia undata* Lec. LI: Aqueduct, Je, *Weeks* (Sf).

PTINIDAE.

(Schaeffer 1930.)

ANOBIIDAE.

(Cooper 1930, 1932b.)

‡12641 *Xestobium rufovillosum* DeG. LI: Flushing, Mar, *Lipsey* (C).

SPHINDIDAE.

(Cooper 1932b.)

**12947 *Odontosphindus denticollis* Lec. Bronx Park (*Sf*).

CISIDAE.

(Belkin 1933; Cooper 1930.)

SCARABEIDAE.

(Belkin 1933; Beutenmuller 1928; Brown 1931; Cooper 1930, 1932b; Dawson 1932; Leng 1928a; Schaeffer 1931b.)

‡13255 *Pleurophorus caesus* Creutz. LI: Flushing (*C*).

**13329 *Phyllophaga luctuosa* Horn. LI: Yaphank, Je, *Engelhardt* (Sf); Wading River, Jul (*Sf*).

‡13803 *Ochrosidia villosa* Burm. LI: Rockaway Beach, Jul, and Coney Island, Jul, *Weeks* (Sf); Flatbush, at light, *Bachelor* (C).

14017 *Trichiotinus texanus* Horn. The Staten Island record in the New York State List is erroneous and should be omitted. The locality of capture is "LI" alone. Sf.

PASSALIDAE.

‡14064 *Passalus cornutus* Fab. LI: Ap, *Engelhardt* (Sf); Flatbush (*Ballou*).

CERAMBYCIDAE.

(Belkin 1933; Cooper 1930, 1932b; Davis 1932b; Leng 1928b; Ragot 1935; Schaeffer 1926, 1933a.)

‡14099 *Smodicum cucujiform* Say. LI: Yaphank, Aug, *Weeks* (Sf).

14179 *Stromatium pubescens* Hald. LI: Yaphank, Aug, *Weeks* (Sf).

14190 *Eburia quadrigeminata* Say. LI: Yaphank, Aug, *Weeks* (Sf); Flushing, *Killen* (C).

‡14463 *Charisalia americana* Hald. LI: East New York, Jul, *Weeks* (Sf).

**14488 *Strangalia deleta* Lec. LI: Yaphank, Jul, *Weeks* (Sf).

14684 *Xylotrechus aceris* Fisher. LI: Flushing, Jul, *Cooper* (Sf); Yaphank, Jul, *Weeks* (Sf).

‡14915 *Hammoderus tessellatus* Hald. LI: Yaphank, Jul, *Weeks* (Sf); Central Park (*Sf*).

‡15020 *Ceratographis biguttatus* Lec. LI: Oakdale, *Schott* (Sf).

‡15121 *Saperda puncticollis* Say. LI: Aqueduct, Jul, *Weeks* (Sf).

CHRYSOMELIDAE.

(Belkin 1933; Cooper 1930, 1932b; Schaeffer 1927, 1928, 1929, 1931a, 1933b, 1933c; Shoemaker 1929b.)

‡—— *Donacia texana minor* Schffr. LI: Flushing, *Cooper* (Sf).

‡—— *D. tuberculifrons* Schffr. LI: Montauk, Jul, *Latham* (Sf).

†15299 *Chlamys cribripennis* Lec. SI: May–Je, *Weeks* (Sf).

**20177 *Cryptocephalus binominis* Newn. LI: Yaphank, May (*Sf*); Jul, *Weeks* (Sf).

‡15675 *Calligrapha amelia* Knab. LI: Bayshore, Jul, Olsen (Sf); Aqueduct, Jul, *Weeks* (Sf); Woodhaven, Jul, *Weeks* (Sf).

‡—— *Phaedon americanus* Schffr. LI: Flushing, *Bowdoin&Cooper* (Sf, *C*).

‡15703 *Gastroidea cyanea* Melsh. LI: East New York, Je, *Weeks* (Sf); Brooklyn, Je (*Sf*); Cold Spring Harbor, *Barber* (Sf); Bayside, Je (*C*).

‡15718 *Phyllodecta americana* Schffr. LI: Flatbush, Jul, *Weeks* (Sf).

16065 *Phyllotreta sinuata* Steph. . . . is a European species not occurring in our fauna; this name should be replaced by *Phyllotreta zimmermanni* Cr. Sf.

16068 *P. robusta* Lec. This species has been recorded from Cranberry Lake by Dr. Hatch, but is probably a misidentification. C.

†16106 *Anoplitis rosea* Web. SI: Aug, *Weeks* (Sf).

BRENTIDAE.

16256 *Eupsalis minuta* Dru. LI: Flatbush, *Ballou* (C); Flushing (*C*); Bayside (*C*); Southold (*C*); Northport (*C*); Whitesone (*C*).

**16256– *E. minuta lecontei* Pow. "NY", *O. Dietz* (Sf); Keene Valley, *Notman*? (Sf); Adirondack Mts., *Engelhardt* (Sf).

PLATYSTOMIDAE.

(Belkin [sic!—as BELIDAE!] 1933; Cooper 1932b.)

‡16279 *Eurymycter fasciatus* Oliv. LI: Yaphank, Aug, *Weeks* (Sf); Southold, Jul (*C*); Flushing (*C*).

‡16290 *Piezocorynus mixtus* Lec. LI: Fire Island, Aug, *Ballou* (Sf, C).

CURCULIONIDAE.

(Belkin 1933; Cooper 1930, 1932b; Crosby and Blauvelt 1930; Leng 1930; Mutchler 1930.)

*‡16361 *Rhynchites aeratus* Say. Mosholu, Je, sweeping (*Sf*); LI: Yaphank, Jul, *Weeks* (Sf).

16641 *Strophosoma coryli* Fab. LI: Granville, Aug, *Engelhardt* (Sf).

‡16752 *Lepidophorus setiger* Ham. LI: Flushing (*C*, Baker).

**17061 *Thysanocnemis balininoides* Schffr. SI: Aug, *Weeks* (Sf); LI: Long Beach, Aug, *Schott* (Sf); Prospect Park, Aug, *Weeks* (Sf).

‡17797 *Ceutorhynchus neglectus* Blatch. LI: Flushing (*C*).

‡17818 *C. puberulus* Lec. LI: Flushing (*C*).

‡17841 *Rhinoncus pericarpius* Fab. LI: Flushing (*C*).

‡17843 *R. longulus* Lec. LI: Flushing (*C*).

**17982 *Cryptorhynchus minutissimus* Lec. LI: Yaphank, Jul–Aug, *Weeks* (Sf); Parkville, Jul, *Weeks* (Sf).

‡18031 *Cossonus impressifrons* Boh. LI: Flushing (*C*).

‡18049 *Phloeophagus minor* Horn. LI: Flushing, *Cooper* (Buch.).

SCOLYTIDAE.

(Belkin 1933; Blandford 1894; Cooper 1930.)

**18173 *Scolytus multistriatus* (Marsh.). LI: Flushing, running about on the bark of a fallen elm (*C*).

‡18186 *Cnesinus strigicollis* Lec. LI: Flushing, *Cooper* (Blkm.).

**18340 *Stephanoderes ?georgiae* Hopk. LI: Flushing, mining in stems of sumach and parasitized by a species of *Heterospilus* (det. Muesebeck), *Cooper* (Blkm.).

LIST OF LITERATURE.

Angell, J. W. 1931. Jour N. Y. Ent. Soc. 39(2): 269 (Proc.). *Cicindela hirticollis* Say.—Sylvan Beach, Lake Ontario.

Belkin, J. N. 1933. Additions to the New York State List of Insects. Bull. B'klyn Ent. Soc. 28(5): 220–222. Unfortunately Mr. Belkin overlooked a number of previously published additions to the State List (see Cooper 1930, 1932b) and so has duplicated some ten records. More than forty species new to Long Island's fauna are recorded, five of which supply new records for New York State. It is suggested that the identities of the *Phelister, Attalus, Ochadaeus, Triachus* and *Oedionychis* be carefully reascertained, for the species recorded are normally found in localities far removed from New York State.

Beutenmuller, W. 1928. Aserica castanea: A new Japanese lawn pest. Bull. B'klyn Ent. Soc. 23(2): 68. *Autoserica castanea* Arrow.—LI: Woodlawn Cemetery.

Blandford, W. F. H. 1894. Rhyncophorus Coleoptera of Japan. III. Trans. Ent. Soc. London, page 106. Although this paper contains no reference to New York insects, in it will be found the original description of *Xyleborus germanus* Bland., a Scolytid introduced in North America at Oyster Bay, L. I. It has been reared from the stems of grape collected at that locality. (A. J. Mutchler.)

Brown, W. J. 1931. Revision of the North American Aegialiinae. Can. Ent. 63(1): 9–19; (2): 42–49. *Aegialia humeralis* Brown.—New York.

Burke, J. 1931. Bull. B'klyn Ent. Soc. 26(1): 52 (Proc.). *Ptinella quercus* Lec.—SI: Willow Brook.

Casey, T. L. 1905. Trans. Acad. Sci., St. Louis 15(2): 118–

119. Records the capture of *Lathrotropis jacobina* Lec. near New York City by Mr. Julich. According to Mr. Schaeffer, there is some reason to believe that the specimen was wrongly labeled.

Chittenden, F. H. 1926. Note on the blister beetle *Macrobasis murina* Lec. Bull. B'klyn Ent. Soc. 21(3): 118. *Macrobasis murina* Lec.—Blue Ridge; LI: Brooklyn. *Murina* is a synonym of *Macrobasis debilis* Lec.; Chittenden's note verifies the early Leconte record, and establishes a new Long Island record.

Cooper, K. W. 1930. A list of Coleoptera found at Flushing and new to Long Island. Bull. B'klyn Ent. Soc. 25(1): 21–24. Sixty-six species are listed, of which two are new to the fauna of the United States and three to New York State. The remainder are new additions to the Long Island records.

————. 1932a. Bull. B'klyn Ent. Soc. 27(1): 71 (Proc.). *Mycophagus* (species novum?).—Darts.

————. 1932b. Additions to the New York State List of Insects. Bull. B'klyn Ent. Soc. 27(4): 189–195. One hundred and forty-two species are listed, twenty-five of which are new additions to the List. The remainder are new additions to the Long Island records.

————. 1934. Bull. B'klyn Ent. Soc. 29(3): 130 (Proc.). *Micromalthus debilis* Lec.—Van Cortlandt Park; Columbia University, in New York City. The records are those of Mr. Alan Scott, of the Department of Zoology, Columbia University. Mr. Scott has also taken this generally overlooked coleopteran at Cold Spring Harbor, L. I.

Crosby, C. R., and **W. E. Blauvelt.** 1930. A European beetle found in New York. Ent. News 41(5): 164. *Cleonus piger* Scop.—Branchport.

Davis, W. T. 1926. Bull. B'klyn Ent. Soc. 21(3): 132 (Proc.). *Calosoma wilcoxi* Lec.—SI: New Brighton.

————. 1932a. A coccinellid beetle new to the fauna of New York State. Bull. B'klyn Ent. Soc. 27(2): 101. *Coccinella undecimpunctata* L.—LI: Orient.

————. 1932b. Bull. B'klyn Ent. Soc. 27(4): 213 (Proc.). *Leptura emarginata* Fab.—LI: Mattituck; *Atimia confusa* Say.—LI: Orient; *Chalcophora georgiana* Lec.—LI: Southold: *Agrypnus sallei* Lec.—LI: East Marion.

————. 1933. Bull. B'klyn Ent. Soc. 28(4): 179 (Proc.). *Anisocalva* [Sic!—*Anisocalvia*] *quatuordecimguttata* L.; *A.*

duodecim-maculata Gebl.; *Exochomus marginipennis* var. *latiusculus* Csy.; all from Orient, Long Island, and collected by R. Latham.

Dawson, R. W. 1932. New species of Serica (Scarabeidae). Jour. N. Y. Ent. Soc. 40(4): 529–562. *Serica atricapilla* Kby. to replace *S. cucullata* Daws.; *S. trociformis blatchleyi* Daws.—Karner, New York City, White Plains, Whiteface Mt.; Long Island.

Fall, H. C. 1927. New Lampyridae. Bull. B'klyn Ent. Soc. 22(4): 208–211. *Photinus ignitus* Fall.—Peekskill.

————. 1934. On certain North American Elateridae, new and old. Jour. N. Y. Ent. Soc. 42(1): 7–36. *Megapenthes solitarius* Fall. Fourth Lake, Adirondacks.

Fisher, W. S. 1928. A revision of the North American species of the buprestid beetles belonging to the genus *Agrilus.* Smithsonian Inst., Bull. 145. *Agrilus champlaini* Frost.—Hudson Falls; *A. arcuatus torquatus* Lec.—Poughkeepsie, New York City; *A. juglandis* Knull.—Ilion, Poughkeepsie; *A. quadriimpressus* Zieg.—Olcott, West Point; *A. viridis fagi* Ratz. (=*A. communis rubicola* Perrin; see footnote, p. 209.)—New York City; *Agrilus celti* Knull.—Albany; Long Island.

Hatch, M. H. 1928a. Brachypterolus pulicarius (L.) in America (Nitidulidae). Jour. N. Y. Ent. Soc. 36(1): 35–36. *Brachypterolus mordelloides* Not. must be regarded as synonymous with *B. pulicarius* (L.).

————. 1928b. Coleopterorum Catalogus 95, p. 201. *Catops clavicornis* Lec. changed to *C. americanus* Hatch. [This species is recorded in the New York State List as *Choleva clavicornis* Lec. Further, all of the species listed in this compilation under the generic name of *Choleva* must be recorded as *Catops.*]

————. 1932. The pennsylvanicus group of Harpalus. Bull. B'klyn Ent. Soc. 27(4): 173–176. *Harpalus effetus* Csy. united with *erythropus* Dej.; *H. delosus* [sic! *dolosus*] Csy. united with *longior* Kby. [*Harpalus longior* Kby. is recorded in the New York State List as *H. longicollis* Lec.] *H. haldemani* Csy. lowered to varietal form of *H. vagans* Lec. *H. convivus* Lec. united with *pennsylvanicus* DeG.

————1933a. Studies on the Leptodiridae (Catopidae) with descriptions of new species. Jour. N. Y. Ent. Soc. 41(1, 2): 187–239. *Nemadus horni* Hatch.—West Point; *Catops*

(*Sciodrepa*) *alsiosus* Horn.—Ithaca; *Catops hornianus* Blanch.—Altamont, Enfield, Ithaca, Mosholu, New York, Olcott, Piseco Lake, Upper Saranac, West Point.

———. 1933b. Pan Pacific Ent. 9(3): 117–121. *Melanius* Bon. to replace *Omaseus* of Leng List.

Knull, J. N. 1930. Notes on Coleoptera—no. 2. Ent. News 41(3): 82–86. *Tillus transversalis* Charp.—New York City.

Lacey, L. 1932a. Bull. B'klyn Ent. Soc. 27 (4): 211 (Proc.). *Adalia frigida humeralis* Say.—Westchester Co. [In this connection, Mr. Schaeffer (Bull. B'klyn Ent. Soc. 28(2): 83 (Proc.). 1933) points out that *Adalia frigida humeralis* Say. of the New York State List is actually *A. bipunctata quadrimaculata* Scop.]

———. 1932b. Jour. N. Y. Ent. Soc. 40(2): 267 (Proc.). *Neoharmonia venusta* Melsh.—Pelham.

———. 1933. Bull. B'klyn Ent. Soc. 28(2): 82 (Proc.). *Ditoma* [sic!—*Bitoma*] *crenata* Fab.—Pelham. *Ibid:* 83 (Proc.). *Glischrochilus obtusus* Say.—Westchester Co.

Leng, C. 1928a. Proc. S. I. Inst. Arts Sci. (5): 37. *Popillia japonica* Newn.—Staten Island.

———. 1928b. Jour. N. Y. Ent. Soc. 36(4): 461 (Proc.). The two Long Island localities for *Saperda shoemakeri* Davis in the New York State List are incorrect, belonging two lines above to *Saperda concolor unicolor* Felt & Joutel.

———. 1930. Jour. N. Y. Ent. Soc. 38(1): 82 (Proc.). *Ceutorhynchus marginatus* Payk.—Staten Island.

Mutchler, A. J. 1930. Jour. N. Y. Ent. Soc. 38(1): 81 (Proc.). *Calomycterus setaerius* Roelfs.—Colonial Heights (Yonkers).

Nicolay, A. S. 1925. Jour. N. Y. Ent. Soc. 33(1): 57 (Proc.). *Pselaphus erichsoni* Lec.—LI: Rosedale.

Nicolay, A. S., and **H. B. Weiss.** 1932. Synopsis of the Cicindelidae, I. Jour. N. Y. Ent. Soc. 40(3): 341–355. "In New York and New Jersey (where *splendida* has not been found) in a series of forty or fifty specimens of *limbalis* generally one or two turn out to be *transversa*." Apparently establishes a new record for New York State!

———. 1934. Notes on Carabidae, including a synopsis of the genera Cylindrocharis, Euferonia, Melanius (Omaseus) and Dysidius of the tribe Pterostichini. Jour. N. Y. Ent. Soc. 41(2): 193–213. *Euferonia vapida* Csy. reduced to variety of *stygica*; *Melanius ebeninus* Dej.—Long Island, *Engelhardt*; *Dysidius purpuratus* Lec.—Staten Island, *Leng*.

Notman, H. 1929. Jour. N. Y. Ent. Soc. 37(2): 177 (Proc.). *Asaphidion flavipes* Linn.—LI: Queens [Flushing], *Cooper & Killen.*

Ochs, G. 1930. Remarks on "A List of the Insects of New York." Jour. N. Y. Ent. Soc. 38(2): 135–138. Corrections, notes and additions for the family Gyrinidae. Also includes a statement by H. C. Fall.

Ragot, Chas. L. 1935. Bull. B'klyn Ent. Soc. 30(1): 31 (Proc.). *Stenodontes dasystemus* Say.—LI: Long Island City. [The labelling of this specimen should be verified.]

Schaeffer, Chas. A. 1926. Bull. B'klyn Ent. Soc. 21(3): 133 (Proc.). *Xylotrechus quadrimaculatus* Hald.—LI: Flatbush.

————. 1927. Bull. B'klyn Ent. Soc. 22(3): 175 (Proc.). *Donacia rugosa* Lec.—LI: Riverhead.

————. 1928. Notes on the species of Lina and allied genera. Can. Ent. 60(2): 42–47. *Lina obsoleta scriptoides* Schffr. described from a series including a specimen from West Point (Type).

————. 1930. Bull. B'klyn Ent. Soc. 25(5): 306 (Proc.). *Dermestes peruvianus* Cast.—LI: Brooklyn, Prospect Park; *Dermestes cadaverinus* Fab.—Manhattan; *Gibbium psylloides* Czemp.—LI: [Brooklyn], Flushing; *Mezium americanum* Lap.—LI: Brooklyn; *Ptinus raptor* Sturm.—LI: Brooklyn.

————. 1931a. New species of Disonycha and notes (Col. Chrysomelidae). Jour. N. Y. Ent. Soc. 39(3): 279–285. *Disonycha quinquevittata* var.—Northern New York; Long Island.

————. 1931b. On a few new and known Coleoptera. Bull. B'klyn Ent. Soc. 26(4): 174–176. *Serica brunnea* L.—LI: Flushing, Cooper. [In a short note (*Serica brunnea* L., Bull. B'klyn Ent. Soc. 27(1): 50, 1932) Mr. Schaeffer calls to attention that the species referred to has been misdetermined. The correct name is *Serica similis* Lew.]

————. 1933a. Bull. B'klyn Ent. Soc. 28(1): 41 (Proc.). *Romaleum hispicorne* Lec.—LI: Fire Island; *Anoplium cinerascens* Lec.—"LI".

————. 1933b. Short studies in the Chrysomelidae (Coleoptera). Jour. N. Y. Ent. Soc. 41(3): 297–325. *Syneta carinata* Mann.—Maplecrest, Je, *Schott*; Slide Mt., *Shoemaker*; Whiteface Mt., *Shoemaker. Lema trilineata trivittata* Say.—Ithaca.

————. 1933c. Short studies in the Chrysomelidae (Cole-

optera) continued. Jour. N. Y. Ent. Soc. 41(4): 457–480. *Bassareus formosus confluentus* Schffr.—New York; Long Island; Van Cortlandt Park. *Hydrothassa boreella* Schffr.—Danby, *Anderson,* on *Caltha palustris. Calligrapha vicina* Schffr.—Olcott, N. Y., Genessee Co.; *C. alni* Schffr.—East Aurora, *Dietrich*; *Phyllodecta americana pallipes* Schffr.—Catskill; Adirondacks.

Shoemaker, E. 1929a. Bull. B'klyn Ent. Soc. 24(3): 198 (Proc.). *Epilachna corrupta* Muls.—New York City.

————. 1929b. Bull. B'klyn Ent. Soc. 24(5): 341 (Proc.). *Physonota unipunctata quinquenotata* Walsh.—Van Cortlandt Park.

————. 1930. Bull. B'klyn Ent. Soc. 25(1): 58 (Proc.). *Casnonia ludoviciana* Sallé.—Piermont.

Siepmann, C. G. 1927. Bull. B'klyn Ent. Soc. 22(3): 170 (Proc.). *Carpophilus nitens* Fall.—LI: Evergreen.

————. 1932. *Omosita discoidea* in New York. Bull. B'klyn Ent. Soc. 27(4): 182. *Omosita discoidea* Fab.—Pelham.

Incisalia Henrici Gr. & Rob. in Connecticut.—On May 11, 1935, I found the very rare little *Incisalia henrici* Grote & Robertson common in the woods in back of our country home in Putnam Heights, Putnam, Connecticut. Only five specimens were taken for positive identification and comparison with the type, but a number of others were seen, all within a radius of fifty feet and within about ten minutes. The butterflies were in a damp, heavy deciduous woods that slopes down gently to a marsh surrounding a muddy pond. They were flying actively close to the ground, alighting mostly on the leaves of Skunk Cabbage which is very plentiful in this environment. About fifty feet away at the edge of the woods the Shadbush or Juneberry (*Amelanchier*) was flowering profusely, and around these blossoms were *Incisalia augustinus* Westw., *I. niphon* Huebn., and *Lycaenopsis pseudargiolus* in some numbers, but no *henrici. Henrici* is known as a very rare butterfly; may this not be partly due to the fact that we have not looked for it in its favorite haunts, but have rather sought it in company with its congeners?

The date, May 11, means little this year, as the season is abnormally late. The fact that the Juneberry and High-bush Blueberry were at the height of their flowering is a better way of dating the above record.—Alexander B. Klots, New York, N. Y.

A NEW SPECIES OF SCIARINAE.*

Frank R. Shaw, Amherst, Mass.

In a lot of material taken in the course of some studies of soil fauna by Mr. J. W. Johnston, of Harvard University, there was one specimen of considerable interest.

The insect in question is a wingless female belonging to the subfamily Sciarinae (fig. 1). The writer was at a loss to identify the specimen and sent it to Dr. O. A. Johannsen, of Cornell University. Dr. Johannsen expressed the following opinion of the specimen:

> "The specimen does not belong to the genus *Sciara*. You will note that the palpi have a different structure and furthermore, I know of no wingless females in this genus. I have looked over the literature which I have and find no wingless female described that has the palpal structure of the specimen that you sent."

In Edwards's classification the specimen would key out to the genus *Peyerimhoffia*. The palpal structure as figured by Lengersdorf, however, does not quite agree with that exhibited in the present specimen. Tentatively, I am placing this species in the genus *Peyerimhoffia*.

Peyerimhoffia johnstoni n. sp.

> ♀. Wingless. Length (slide mount) 1.16 mm. Head and basal two segments of antennae brown; remainder of body pale yellow. Halteres lacking, ocellar bridge present. Palpi (fig. 2) two-segmented, the first more or less pear-shaped, the second ovoidal. Tibia spurred. Type in my collection. Type locality Petersham, Mass.

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* Contribution from the Entomological Laboratory of the Massachusetts State College, Amherst, Mass.

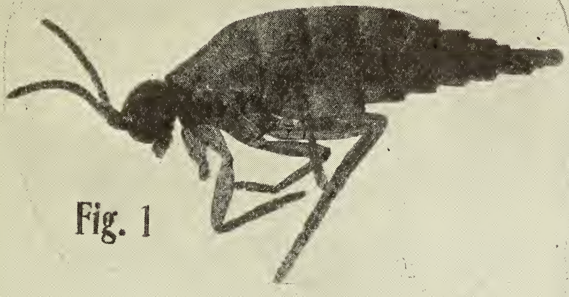

Fig. 1

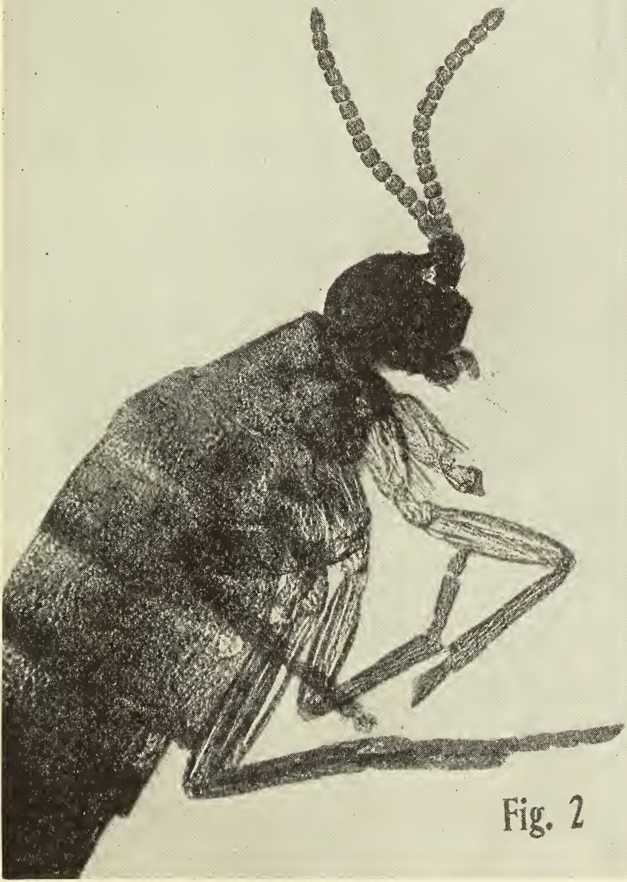

Fig. 2

COMPARISON OF COLOR MARKINGS OF CICINDELA FORMOSA SAY AND CICINDELA FORMOSA GENEROSA DEJ. (COLEOP.: CICINDELIDAE.

By F. G. Meserve, Lincoln, Nebr.

After studying over three hundred and fifty specimens of *Cicindela formosa* Say and *Cicindela formosa generosa* Dej. in the collection of the Department of Entomology of the University of Nebraska several conclusions are obvious and worthy of being recorded. The eastern form of *Cicindela formosa generosa* as found in New Jersey is more near the type of the sub-species. It is dull red cupreous in color. The middle band of the elytra is strongly deflexed and narrower than specimens found in Nebraska and Iowa. *Cicindela formosa* of Nebraska is of a lighter reddish or cupreous color and has a metallic lustre. Some are greenish red. Those from the extreme western part of Nebraska particularly show this light greenish-red hue. The middle cross band is almost straight to slightly deflexed and slightly bent obtusely. There are many variations in color and markings of the Nebraska species. Some are duller and darker in color and have strongly deflexed middle bands. These bands are wider than those from the extreme eastern part of the United States. In some the color is like *Cicindela formosa* and the middle band similar, although somewhat wider than in *Cicindela formosa generosa.* In others the color is like *Cicindela formosa generosa* and the middle band more like *Cicindela formosa.*

The series from Iowa is darker than the one from Nebraska and more like the eastern one in color. The middle band varies, however, as it does in *Cicindela formosa* in Nebraska. It seems, therefore, that *Cicindela formosa generosa* from the eastern part of the United States and *Cicindela formosa* from the mid-west have intergradations in the mid-west as found in Nebraska and Iowa. Those from Iowa more closely resemble the extreme eastern forms than do those from Nebraska.

Some specimens in our cabinet closely resemble *Cicindela formosa manitoba* Leng. In comparing *Cicindela formosa* from Nebraska with *Cicindela formosa manitoba* which were donated by Mr. W. Knaus we find that the color pattern is similar to that of the Manitoba sub-species. The white markings of the Nebraska sub-species are extremely broad so that almost one-half of the elytra are white. The color is dull bronze brown in both.

CHARLES ROBERTSON.

June 12, 1857–June 17, 1935.

By H. B. Parks, San Antonio, Texas.

The death of Charles Robertson brings to an end the first chapter in the development of ecology in the United States. His first paper appeared in 1884, his last in 1934. His bibliography contains about one hundred twenty-five titles. His best known work is a series of papers entitled "Flowers and Insects," which appeared in the *Botanical Gazette,* the Bulletin of the Brooklyn Entomological Society, and *Ecology.* This series is a discussion of the flowering plants of the Carlinville, Illinois, area and their relation to their insect guests. This series later appeared in a book called "Flowers and Insects," which contains a summary of these articles together with much new material.

He read several languages and was in demand as a reviewer of foreign publications on botany and ecology. He reviewed Knuth's "Handbook on Floral Ecology" for the *Botanical Gazette* and was at work on a translation of this monumental publication at the time it was announced that an English edition would be printed. Robertson was very methodical in everything which he did. In 1883 he became interested in floral ecology. He worked out a plan for carrying on an intensive study of flowers and insects in a territory about twenty miles square. This work he carried on through a period of fifty years. In making the plans for this work he estimated the material needed and purchased a sufficient amount so that he would not be inconvenienced by a change of equipment. His estimates proved true. He had no patience with hasty, slipshod work on the part of his students or co-workers. His own collections are models. It is estimated that at the time of his death his collection contained thirty thousand mounted insects, mostly hymenoptera, and a plant collection of over five hundred species. Each specimen carries with it minute details, noted at its capture in the field. He did not desire a general collection, but only those things which illustrated some phase of floral ecology. It is safe to say that 98 per cent of his collection came from within ten miles of his home. The collection is rich in type material. As he described many species, this collection is of great value to science. Robertson contributed the majority of his original descriptions to the Canadian *Entomologist,* the *Transactions* of the St. Louis Academy of Science, and the *Transactions* of the Philadelphia Academy of Science. The articles on floral ecology have been mentioned. His miscellaneous articles on plant and insect relationships and topics of the day have appeared in many journals in the United States and in Europe. He belonged to many scientific organizations and was well known throughout the entomological world.

Charles Robertson was born and died in the same city. His father, Dr. W. A. Robertson, was for years Carlinville's leading physician and druggist. The boy Charles was destined to follow the father as a physician, however, he was more interested in the study of natural history, than of medicine and as the family needed someone to look after the large land holdings, the boy took over this task to leave his father free to his practice. He attended several eastern universities for short periods, selecting his own course of study and specializing in those things which he desired. He taught in a local school for many years, more as a help to the school than for the honor of the position. The Robertson family donated a science building to this school.

Robertson was a correspondent and close friend of many of the older scientists. Trelease, Barnes, and the scientists belonging to the St. Louis Academy of Science formed a group, which held an annual reunion for many years at Beaver Dam Lake near Carlinville. For nearly forty years Robertson spent his winters on the west coast of Florida, where he owned a plant, insect, bird preserve, which many of the readers of this Journal have been privileged to visit.

Robertson was a teacher who could induce his pupils to like any subject. Being versatile he was called upon to give a course in Greek and, strange to say, it was one of the most popular courses given that year and—the pupils actually learned Greek. The writer was intimately connected with Robertson from 1886 to 1900 and can probably appreciate this man and his work more than those who knew him only through his articles. It is safe to say that the great work of Robertson's life was not his contribution to a greater knowledge of ecology or of systematic entomology, but the fact that he unified the study of ecology in the United States and saved it from the fate which it suffered in Europe.

THE GENUS HERMETIA IN THE UNITED STATES (DIPTERA, STRATIOMYIDAE).

By Maurice T. James, Colorado State College, Fort Collins, Colo.

A study of flies of the genus *Hermetia* has brought to light two very distinct species which are, apparently, undescribed. Since no key exists for the identification of the species known from the United States, and since this list of species is probably complete for our range, a brief review of our species is herein presented. This review is only preliminary to a monograph of the species of the world, which is now in the course of preparation.

Hermetia may be distinguished from all other North American genera of Stratiomyidae by the peculiar structure of the last antennal piece (sometimes referred to as the style of the flagellum); this segment is elongated, being as long as or longer than the remaining segments of the flagellum taken together, is flattened, and is fringed on both edges with short, dense, hairs. The discal cell gives off four veins, the cross-vein m-cu being absent, and the scutellum is devoid of spines. These flies are of moderate to large size for Stratiomyidae, and, as a rule, are moderately elongated and slender.

The immature stages of *H. illucens* are well known; the larval habits are varied. Malloch (1917) describes and figures the larva and puparium and cites records of its being bred from beeswax, catsup, decaying vegetables, and potatoes. Larvae have been reported from the cadaver of a man in the Canal Zone (Dunn, 1916); from bee-hives (Copello, 1926); from dead crabs, in Samoa (Ricardo, 1929), and from the nests of Melponidae (Borgmeier, 1930). We also have unpublished records of intestinal myiasis being caused in man by this species. Engelhardt (1928) records taking larvae of *H. aurata* in damp soil, under logs, in Arizona. *H. hunteri* was bred from cactus in Texas.

The following key will serve to identify our species. *H. hunteri* was placed from its description, for the sake of completeness; the others I have examined personally. Several species not occurring in our range have been included in order to show affinities.

Hermetia—Key to Species.

1. Eyes bare 2
   Eyes distinctly pilose 4
2. Almost wholly black species; femora and tibiae mostly black . 3
   Predominantly yellow; legs brown . . . . *hunteri* Coq.

3. Squamae white, white-haired .... **nucis** n. sp.
Squamae black, black-haired .... *illucens* L.
4. Face, from anterior view, rounded 5
Face, from anterior view, acute, conically projecting 7
5. Abdomen black in ground color 6
Abdomen red or reddish in ground color ...... *aurata* Bell.
6. Yellow pubescence on whole of segments two to four. *chrysopila* Lw.
Yellow pubescence confined to apices of these segments. *eiseni* Tns.
7. Legs entirely yellow; abdomen terete .... *comstocki* Will.
At least the femora largely black; abdomen more or less flattened 8
8. Femora and tibiae black; second abdominal segment with a pair of translucent spots .... *albitarsis* F.
Tibiae pale; second abdominal segment concolorous 9
9. Head black; thorax black 10
Head yellow; thorax mostly yellow, golden-haired. *concinna* Will.
10. Thorax yellow-pilose .... *lativentris* Bell.
Thorax black-pilose .... **reinhardi** n. sp.

Hermetia hunteri Coq.

H. hunteri Coquillett, Canad. Ent., 41: 212, 1909. Texas.

Hermetia nucis n. sp.

Close to *H. illucens* Linn., but the abdomen is wholly black dorsally in the male, and with at most a pair of small, yellow opaque spots in the female; the abdomen is more pointed apically; the vertex, in the male, is much narrower; and the squamae are white, with a white fringe. The head also has a greater quantity of yellow pile.

Male. Head black; eyes margined with yellow along the vertex and to a short distance below the occipital triangle; a yellow spot along each eye in the middle of the front, and another below the antennae, this latter extending laterally to the eyes and along the inner occular margins. Facial projection pointed below. Vertex narrow, the distance from the ocellar triangle to each eye being no greater than the base of the ocellar triangle. Eyes bare. First antennal segment but slightly longer than the second. Pile of face black, that of front black mixed with yellow. Thorax black, clothed with appressed silvery tomentum; some semi-erect white intermixed with a little black pile laterally; pleura white-pilose. Scutellum black. Squamae white or yellow, with a fringe of white hairs. Abdomen elongated, somewhat ovate, strongly tapering apically; black, wholly opaque, and with at most a little reddish-brown laterally; its vestiture consists of short, white, appressed pile, with a much longer silvery pile forming triangles at the outer posterior angles of segments two to four. A little black pile laterally on segment one. Venter black, pile short, white, inconspicuous. Legs black, yellowish-pilose; the posterior tibiae yellow on the basal fourth; tarsi yellow, the apical one or two segments darkened and black-haired. Length, 8–15 mm.

Female. Similar to the male; the first antennal segment is longer in proportion to the second; the vertex is wider; there is a pair of small yellow spots on the first abdominal tergite, these being more expanded and (sometimes) transparent on the sternite. Differs otherwise only sexually. The female is more difficult to distinguish from *H. illucens,* but the white squamae will serve to distinguish the species in both sexes.

Holotype: Male, Santo Tomás, P. de Zapata, Cuba, May 5–9, 1927 (S. C. Bruner & J. Acuña).

Allotype: Female, Jobabo, Cuba, April 20, 1925, T. P. R. F. Ent. No. 331 (C. F. Stahl).

Paratypes: 2 males, Cuba, E. E. A. de Cuba No. 9178; male, Lake Worth, Florida, Nov. 4, 1928; Female, Lake Worth, Fla., Nov. 6, 1928.

The male paratypes labelled "E. E. A. de Cuba 9178" were reared from the dead tissue of the coconut. The Florida specimens are considerably larger than those from Cuba, but evidently conspecific. Holotype, in the writer's collection; Cuban paratypes, in the Cuban National Collection; Florida paratypes, in the collection of Dr. S. W. Bromley.

Hermetia illucens Linn.*

This common species occurs in the moister tropical and subtropical regions throughout the world. Its distribution in North America is as follows: N. C.: Chadbourn, Nov. 27, 1925 (Bromley); Willard, Oct. 5, 1934 (F. S. Blanton). S. C., Ga., Fla., Ala., La., Texas: numerous records. Cuba, Porto Rico: common. Ark.: Carroll Co., Sept. 17, 1932 (Geo. E. Gould). Okla.: Wilburton, June 8, 1934, and Hugo, June 21, 1934 (A. E. Pritchard); Smithville, June 10, 1934, and Idabel, Oct. 7, 1931 (E. Hixson).

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* For references and synonymy, see Aldrich's *Catalogue,* for starred species.

Ariz.: Tucson, Aug. 1 (A. A. Nichol), Sept. 29 (C. T. Vorhies), Sept. 26 (F. H. Parker), Oct. (J. M. Breazeale); Globe, Sept. (Duncan); Mesa, April (Nichol). Calif.: Riverside, numerous, June to Oct. (Timberlake); April 8 (H. H. Smith). Mexico & Central America: Common.

Hermetia aurata Bellard.*

This and the two following species are closely related to each other. The amount of black on the scutellum is apparently a variable character.

Distribution. Texas: Donna, May, June, July, and Oct. (J. W. Monk). Calif.: San Diego, July 30, 1921, and Aug. 20, 1921. Mexico: Morelia (type); Lower California (recorded by Townsend).

Hermetia chrysopila Loew.*

Distribution. Texas: Type. Austin, Apr. 15 to May 19; Eastland Co., April 17 to May 16, 1921 (Grace O. Wiley); Austin (R. H. Painter). N. M.: Magdalena Mts., 8,400 ft., July 23, 1930 (E. R. Tinkham). Ariz.: Baboquivari Mts., April (Duncan); S. Catalina Mts., April (Duncan); Globe, Aug. (Duncan). Kansas: Clark Co., June (F. H. Snow); Manhattan, June 4 & 8, 1932 (C. W. Sabrosky). Colo.: Boulder, May 26, 1934 (D. F. Aultz). This Colorado record is surprising; it is a northern record for the genus.

Hermetia eiseni Townsend.*

Lower California (type). The type specimens have black markings on the tibiae; these are lacking in the two preceding species. Otherwise, except for the abdominal pile, they are much the same.

Hermetia comstocki Williston.*

Mimics *Polistes*. Distribution. Ariz.: Type. Ramsey Cañon, Huachuca Mts. (F. X. Williams); Huachuca Mts. (R. H. Beamer); Sierra Ancha Mts., July (Duncan); S. Catalina Mts., April (Duncan); Baboquivari Mts., Apr. (Duncan). Sonora, Mexico: recorded by Osten Sacken.

Hermetia concinna Williston.*

Ariz.: Pimal Mts.; Baboquivari Mts. N. M.: recorded by Williston. Texas: Chinati Mts. (Tinkham).

Hermetia reinharti n. sp.

This species is close to *H. lativentris* Bell., but the black pile of the thorax will readily distinguish it.

> Male. Head black; a spot contiguous with each eye in the middle of the front, the region at the base of the antennae and extending onto the facial prominence, and the inner ocular margins of the face, a dirty yellow. Frontal protuberance prominent, elevated distinctly above the ocellar triangle. Eyes clearly black-pilose. Antennae black; first and second segments yellow; the first segment more than twice the length of the second. Pile of head largely black, but interspersed with yellow pile on the vertex and in the depressions of the front. Thorax and scutellum entirely black and black-pilose, with suggestions of reddish yellow along the sides of the dorsum, the posterior angles, and the extreme apex of the scutellum; sternites with a slightly reddish cast. Abdomen orange in color; the first segment black dorsally, except for a small amount of yellowish toward the apex, and black on the basal half ventrally; second segment with a median black stripe, about one-eighth the width of the segment, which connects basally with the black of the first segment and extends apically almost to the apex of the second; the black of the first segment also encroaches upon the second in the form of narrow lateral margins which gradually fade into orange about the middle of the second segment; the pale coloration of the second segment is more yellowish than on the following segments, both dorsally and ventrally. Coxae, trochanters, and femora black, with somewhat of a reddish tinge, black-haired; tibiae and tarsi wholly pale yellow, with concolorous pile. Wings rather strongly infuscated with brown, especially near the costal margins and adjoining the stronger veins. Length, 16 mm.

Holotype: Male, Oilley, Texas, May 6, 1920, No. 3108 (H. J. Reinhard). H. J. Reinhard Collection.

Paratype: Male, Travis Co., Texas, summer, 1931 (J. K. G. Silvey).

The paratype is somewhat smaller than the holotype, being about 11 mm. in length; otherwise, it agrees with the above description.

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The American Species of Lipoptena (Diptera, Hippoboscidae).—A revision of the deer parasites of the genus *Lipoptena* was sent in for publication over a year ago. Since there seems to be no prospect of having it appear in the near future, the following summary will be useful. I recognize in the Americas four species: 1. **L. ferrisi,** new name, a common parasite of western black-tailed deer, mule deer and western white tailed deer in British Columbia, Oregon, California and Montana. This is the species described and figured by Ferris and Cole as *L. subulata* (1922, Parasitology, XIV, p. 187, figs. 2*c* and 4).—2. *L. cervi* (Linnaeus), an introduced species in New Hampshire, Massachusetts and Pennsylvania, on Virginia deer. *L. subulata* Coquillett is a synonym.—3. *L. depressa* (Say), a common parasite of western black-tailed deer and mule deer. I have seen it from British Columbia, Washington State, Oregon, South Dakota, California, and Montana.—4. *L. mazamae* Rondani, a common parasite of tropical deer and brocket throughout Central and South America, and of eastern white-tailed deer in Georgia, Texas, Florida and South Carolina. *L. depressa* var. *mexicana* Townsend, *L. conifera* Speiser, and *L. surinamensis* Bau I regard as synonyms.—J. Bequaert, Harvard University Medical School, Boston, Mass.

PROCEEDINGS OF THE SOCIETY.

Meeting of February 14, 1935

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, February 14, 1935, at 8.15 p. m. President Davis in the chair and six other members present, *viz.,* Messrs, Engelhardt, Lipsey, Nicolay, Ragot, Sheridan and Siepmann, and Messrs. Gerberg, Kerrish and Stecher, and Miss Potter and Miss Regenbogen.

Mr. Engelhardt presented the report of the treasurer and an approximate estimate of receipts and expenditures during 1935, which were ordered placed on file. He reported that the publications of the society were receiving wider recognition than they had in the past, and that occasional inquiries and orders were coming in from abroad. He also said that the good will which was being built up by the editor and himself through their correspondence with subscribers were becoming a valuable asset to the society.

In order to promote sales on reprints, worthwhile reductions have been made on certain papers, which have been advertised in the February number of the Bulletin.

The Report of the Publication Committee for 1935 was read by Mr. Engelhardt and was placed on file.

Mr. William T. Davis read part of a letter he had received from Mr. Robert P. Dow, of Laguna Beach, California, who has been a member of the society for many years. He also showed a photograph of Nathan Banks, whom he described as "a specialist in all orders of insects."

Mr. George Lipsey, 40–47 167 Street, Flushing, Long Island, New York, was proposed for membership by Mr. Engelhardt. Mr. Lipsey being present, a motion was made and seconded that the By-Laws be suspended, and that Mr. Lipsey be elected. This was done, and the candidate was declared elected.

Mr. Sheridan suggested that the society have an attendance register, in which the members and others attending each meeting sign their names, as is the custom in some of the local societies.

Mr. William T. Davis called attention to the notes about *Actias luna* var. *rubromarginata* in the Bulletin of the Brooklyn Entomological Society for December, 1933, pages 232 and 239, and showed three moths raised from the caterpillars presented to him by Mr. Charles Rummel, of Newark, N. J. One male emerged August 21, 1933; one male on August 30, 1933, and one male May 18, 1934. All cocoons were kept indoors and none produced the hoped-for variety *rubromarginata.*

Mr. Nicolay spoke of his collecting trips to Mt. Pisgah, N. C., Mt. Washington, N. H., and to other mountains of the East, during the past few years, chiefly in search of Carabidae.

In 1927 he collected at Mt. Mitchell, N. C. The whole top of this mountain was a paradise for collecting Carabidae, no other place he has so far visited comparing with it. Mt. Mitchell is rather widely separated from the other mountains, being neither in the Black Mountains nor in the Great Smokies. *Maronetus* were obtained here by digging deep into the moss and mold. He said that Mr. Beutenmüller had collected in this region a long time ago, but that he labelled all the material "Black Mountain, N. C.," including many specimens which were collected for him by the natives. This material did not all come from the same place, and the legend "Black Mountain" is misleading, as there are three widely separated places called Black Mountain in this region.

In the Blue Ridge Mountains at Skyland, Va., there wasn't any sphagnum moss and decaying leaves as at Mt. Mitchell, and collecting was accordingly not as profitable. Collecting in the Unicoi Mountains around Sweetwater was also rather unprofitable.

Mr. Nicolay said that the locality where *Scaphinotus guyoti* occurs has been lost; and that no specimen of this beetle has been collected since it was described. He said that he did not believe any collector has gone up Mt. Guyot in recent years, but he did not think that *guyoti* came from this mountain. The mountains of northern Georgia seemed a more likely place.

Mt. Pisgah, N. C., was a rather dry mountain, and was not as good a collecting place as the Great Smokies or Mt. Mitchell. A list of the species obtained is filed with the minutes; among the more interesting ones obtained were: *Scaphinotus andrewsi* Harr., *Scaphinotus tricarinatus* Csy., *Maronetus hubbardi* Schwarz, *Maronetus alpinus* Beut., *Sphaeroderus canadensis* Chd. var. *lengi* Darlington, *Sphaeroderus bicarinatus* Lec., *Anillus fortis* Horn, *Tachyta inornata* Say, *Trechus schwarzi* Jeannel, *Microtrechus vandykei* Jeannel, *Microtrechus* n. sp., *Feronia palmi* Schaeffer, and *Dicaelus teter,* Bon.

Mr. Nicolay exhibited specimens of some of the more interesting species obtained at Mt. Pisgah and elsewhere. He said that during the next few years he planned to collect in the mountains of Georgia, near Clayton; along the Kentucky-Virginia Boundary, and on Mt. Mitchell.

The meeting adjourned at 9.55 p. m.

Carl Geo. Siepmann,
Secretary.

MEETING OF MARCH 14, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, March 14, 1935, at 8.10 p. m. President Davis in the chair and eleven other members present, namely, Messrs. Cleff, Engelhardt, Lemmer, Lipsey, Moennich, Nicolay, Rau, Sheridan, Shoemaker, Siepmann and Dr. Tulloch, and Messrs. Gerberg, Karish and Stecher and Miss Potter.

The minutes of the previous meeting were read and approved, and Mr. Engelhardt reported for the Treasurer and the publication committee.

Mr. William T. Davis exhibited a specimen of the crawfish, *Cambarus blandingii* which he obtained in the Bronx River, New York, making the third species of crawfish to be recorded from Greater New York. He also exhibited specimens of the widely distributed *Cambarus bartonii* and of *C. limosus,* which is found in the city parks. A full account of the crawfish appears in the *Proceedings* of the Staten Island Institute of Arts and Sciences.

Mr. Lemmer exhibited the following interesting Lepidoptera: *Anomis fimbriago* Steph., collected by himself at Lakehurst, N. J., October 1–16, and a New Jersey record; *Anomis erosa* Hbn. collected by himself at Lakehurst, N. J., October 1–8; *Phobolosia duomaculata* B. & Benj. and *Heliocontia margana* Fabr. collected by F. H. Benjamin at Brownsville, Tex.; *Metachrotis semifascia* Sm. collected by Mr. Engelhardt at Jemez Springs, New Mexico, July 2, 1929.

Mr. Engelhardt related his experiences on a collecting trip through northeastern and northwestern California and western Nevada during July, 1934, as a companion to Mr. E. P. Van Duzee, of the California Academy of Sciences, San Francisco.

Starting at Alameda on July 2nd and headed for Carson City, Nevada, the route selected followed the trail of the gold miners of '49, passing through Sonora, Amador, Placerville and other historic mining centers. The innumerable dumps and diggings of hectic days are now mostly concealed under a mantle of bay, manzanita and digger pine, but the old towns are preserving their landmarks, such as the pony express, court house, assay office, etc., all duly inscribed. Bret Harte's and Mark Twain's camps also bear tablets and the latter's celebrated sketch of the "Jumping Frog" remains an annual sporting event.

The summer of 1934 will be remembered for its intense heat and prolonged drought. Wilted vegetation and a paucity of insects went hand in hand. Only along water courses and at high elevations was collecting worth while.

Carson City, with alkaline deserts on one side and forested mountains bordering on Lake Tahoe on the other, offered opportunities for diversified field work. The best results were obtained in Kings Canyon, easily accessible from Carson City over an old dirt road. Flowering mints were swarming with Lepidoptera. Hymenoptera and Diptera. It is the type locality for numerous species of insects described by the late Dr. A. C. Baker and invites further collecting, particularly at high elevations, where there are many springs and moist meadow lands.

Mono Lake, in its picturesque setting of promontories and extinct craters, proved disappointing. Its immediate shore line, like that of the Great Salt Lake, presented a mass of putrefying Diptera and Crustacea, too nauseating to attempt more than the capture of a few Cicindelidae, Lycaenidae and Chrysomelidae.

A stretch of country along the highway between Carson City and Reno had a magnificent growth of a large, yellow evening primrose. Two visits at dusk, in the hope of capturing some of the rarer western hawkmoths, produced only two common species—*Celerio lineata* and *Protoparce sexta.* Pyramid Lake, after motoring half the distance of forty miles from Reno, was given up, because of bad roads and the utterly desolated appearance of the country.

Northward from Reno there is a succession of dry lakes, basaltic upheavals, and alkaline deserts, barren in the extreme. Not until after passing Susanville did collecting improve. Two days were spent at Chester and Lake Almanor, the latter a huge reservoir still undergoing the process of filling up to its ultimate high water level. The shore, cleared of its original growth of timber, has been transformed into meadows of flowering plants and low shrubs, ideal for the entomologist. Miscellaneous captures include a number of the beautiful Cerambycid, *Desmocerus auripennis* taken on elderberry. Clearwing moths (*Aegeriidae*), Mr. Engelhardt's special study, were boring at the base of willows, however too late in the season to obtain pupae or adults.

The climax of the trip proved to be Mt. Lassen. A fine, new road encircles the whole mountain. It winds among deep forests, open slopes, along rushing streams, past springs of hot and cold water, through lava flows and regions of devastation, attaining an elevation of over 9,000 feet at timberline, just below the crater caused by the 1915 eruption. Here the handsome clearwing moth, *Synanthedon tacoma,* not uncommon at or above tree line on all the mountains of the Pacific Northwest, was found swarming about the low growing wild buckwheat, *Polygonum davisii.* The discovery that the larvae of this moth bore in the enormous roots of this plant was a source of much satisfaction after a vain search of many years. The few hours available for collecting proved all too short to do justice to the varied fauna. A week or two barely would suffice.

The return trip was made after a detour via Red Bluff, Ashford and Grant's Pass to Crescent City on the coast, beginning from there the unforgettable drive of nearly 200 miles over the Redwood Highway. The coast redwood, *Sequoia sempervirens,* while not attaining the circumference and bulk of the mountain redwood, *Sequoia gigantea,* excels in gracefulness and in height, some of the trees measuring over 350 feet. They thrive best under the protecting inland slopes of the coastal range of mountains, not growing continuously, but rather in isolated groves which now, controlled by the State, will be preserved for posterity.

Collecting among the redwoods, at least in midsummer, is disappointing. Sequoias appear to be exceptionally free from insect attacks. In groves, left undisturbed, the forest floor presents an almost impenetrable jungle of the fallen giants, magnificent ferns and tangles of rhododendron, manzanita and other shrubs. Side trips from the Redwood Highway included Clear Lake and the Petrified Forest near Calistoga with its huge tree trunks, much larger than those of the Petrified Forest of Arizona, but lacking in the coloration.

Mr. Engelhardt exhibited a long series of the clear-wing moth, *Synanthedon tacoma,* together with its food-plant, *Polygonum davisii.* This series, including examples from Washington, Oregon and northern California, indicated a fairly constant species, brightening slightly in coloration to the south and darkening to the north. With the food-plant known a further extension of its range north and southward can be expected. It has not been recorded from the Rocky Mountains. Various other insects from Mt. Lassen, Mono Lake and other regions visited were also shown.

The meeting adjourned at 10.10 p. m.

CARL GEO. SIEPMANN,
Secretary.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXX December, 1935 No. 5

PRESOCIAL BEHAVIOR AMONG THE HEMIPTERA.

By J. Bequaert, Department of Tropical Medicine, Harvard University Medical School, Boston, Mass.

It is now generally understood that social habits have arisen repeatedly and independently among different groups of solitary insects. Although the incentive which conditioned the emergence of social behavior need not have been the same in all cases, it appears nevertheless that all insect societies originated in much the same fashion and consequently have a similar fundamental structure. As W. M. Wheeler expresses it, each insect society "is a family consisting of two parent insects and their offspring or at least of the fecundated mother and her offspring, and the members of the two generations live together in more or less intimate, coöperative affiliation." Since the parent-offspring relation lies at the root of all insect social life, a study of this relation among solitary insects should throw some light upon the evolution of social behavior.

Much attention has been paid recently to the incipiently social, or *subsocial,* insects. In these forms, the newly hatched young stay with both or one of the parents for a limited time, being fed meanwhile; each of the offspring, however, is wholly or primarily interested in itself and little or none in the welfare of the community. Subsocial habits evidently arose from a more primitive familial relation, now exhibited by insects in which one or both of the parents merely guard the offspring temporarily, without providing it with food, a type of behavior which may conveniently be called *presocial.* The term *infrasocial* might then be restricted to the numerous species of insects that leave the eggs or newly born larvae to their own fate, although the female may display more or less ingenuity or foresight during oviposition.

Presocial habits are observed as exceptions in several unrelated groups. They are not even confined to insects, since they are exhibited also by scorpions and some spiders. For some time I have been gathering material for an account of parental solicitude among the true Hemiptera or Rhynchota, an order in which a number of interesting cases have come to light in recent years. It is to be expected that many more will be added, when these much neglected insects are adequately observed in the tropics.

Dr. R. F. Hussey recently (1934) presented a review of this topic and I do not intend duplicating his paper. I shall merely offer a revised list of the known cases, arranged systematically, with additional information on some that are new or little known. The appended bibliography is, however, complete, since no satisfactory list of papers dealing with parental care in Hemiptera has been published for the past thirty years.

Moreover, a renewed discussion of parental care among hemipterous insects is by no means amiss. Some of the most authentic cases are regarded with suspicion or even discredited in certain quarters, apparently following Fabre's (1901 and 1903) unfortunate blunder with regard to *Meadorus* (or *Elasmosthethus*) *griseus*. Even in H. Weber's recent "Biology of the Hemiptera" (1930), this matter is inadequately treated.

I do not include among the cases of presocial behavior reported below, any of the Belostomatidae, in which the adult males carry the eggs on the back during the incubation period. It has been shown that in these insects the female forcibly seizes another individual of the same species (usually a male, more rarely a female), on whose back she lays the eggs. These egg-carrying individuals can therefore hardly be regarded as evincing parental solicitude or even interest in the offspring. The case of *Phyllomorpha laciniata* (Villers) (Coreidae), of southern Europe, is excluded for the same reason. In this insect also the eggs are placed loosely by the female on the concave back of the male, where they are kept in place by a series of slanting spines, until the nymphs hatch.

RHYNCHOTA.

(Hemiptera Heteroptera.)

SCUTELLERIDAE.

The earliest observation of insects of this family caring for the offspring, was by Father A. Montrouzier (1855; translated by Kirkaldy, 1902), in Woodlark Island, off the eastern coast of New Guinea. He seems to have observed this behavior for several species, but he mentions none by name and no observations have since been made tending to clear up their identity. Quite possibly one of his species was a *Cantao,* since he describes in the same paper (p. 93) *Scutellera variabilis,* a species now placed in that genus.

Tectocoris diophthalmus (Thunberg) (Syn.: *T. lineola* Fabricius), of the Oriental and Australian regions, was observed by F. P. Dodd (1904) and by E. Ballard and F. G. Holdaway (1926), in Queensland. The female attaches the eggs in a mass to an upright twig and usually stands over them until they hatch. If she leaves them, she will be found close-by and the brooding may last as long as 17 days. She attempts to protect the eggs against chalcid parasites. K. C. McKeown (1933) merely cites Dodd's observations.

Cantao ocellatus (Thunberg), of the Oriental Region, was repeatedly observed in India guarding the eggs and young nymphs (see H. Maxwell-Lefroy and F. M. Howlett, 1909; T. B. Fletcher, 1914; T. V. Ramakrishna Ayyar, 1920). R. Takahashi's (1921) elaborate study of this insect in Formosa was published in Japanese. Some years ago I had a translation made of his paper, so that I now can make his observations more generally available. I quote from him:

> "With the tip of her abdomen the female lays ten or twenty or more eggs on the under side of the leaves of certain trees. Generally eggs of Hemiptera are not white, but those of *Cantao ocellatus* appear so. The female oviposits only once and the eggs are placed in a single row. After she has laid the eggs, she places her abdomen over them, extends the antennae forward and stays there without moving, never leaving the spot even for a walk. She never takes food once the eggs are laid. Before they lay eggs, the females walk a good deal; sometimes they jump, at other times they keep quiet. When the insect is not moving or walking, it easily drops to the ground if touched with the point of a pin. After oviposition the female becomes dormant and never leaves the spot where the eggs were laid until she dies.
>
> "If approached, she moves her legs and antennae a little, and if touched with a pin or other object, she moves her body a little, but she never walks away nor drops to the ground. I have moved the antennae and legs and pressed them with a pin in many specimens, but they never left the spot and clung to the eggs. The female frequently lifts her head while sitting on the eggs, and sometimes she moves her legs to the left and the right and cleans her antennae.
>
> "The egg hatches about eight days after it has been laid. A group of eggs hatch at the same time. This is because

> when one egg hatches, the movements of the young nymph cause the other eggs to hatch. The female never moves from the spot and stays there even after the eggs have hatched.
>
> "After the eggs have hatched the nymphs remain in the egg shells and do not take food nor move about. In other words, the nymphs stay under the maternal body. They undergo two moults within about six days; a few days later they begin to move about together, leaving the egg-shells and looking for food. This then ends the maternal protection, the nymphs feeding after the second metamorphosis.
>
> "The female stays on the same spot until she dies, even after the eggs have hatched and the nymphs are scattered. The cause of death is, of course, hunger. A few females even die before the eggs hatch. In this case, after the female's death, the male never attempts to take care of the eggs, but these hatch just the same without difficulty."

Takahashi also describes experiments showing that a female, removed from her own batch of eggs, will readily adopt a batch of strange eggs or of strange young nymphs and even a batch of hatched, empty egg-shells. If placed on a leaf, away from eggs or larvae, she usually remains on the spot in a dormant condition and does not attempt to search for eggs or nymphs. Under such conditions, however, a female may sometimes wander away and if she then meets with eggs or nymphs, she does not attempt to take care of them. A female which has not yet oviposited cannot be induced to stay with eggs or young nymphs. The author concludes that "the female of *C. ocellatus* cannot discriminate between her own eggs or nymphs and those that belong to another female and that in fact all females become dormant after the eggs are laid."

Ramakrishna Ayyar's rather inaccessible account is as follows:

> "This insect is one of the few and interesting examples of insects exhibiting what may be called 'parental care.' The mother-bug sits on the eggmass and continues to do so from the time the eggs are deposited until after they hatch out into young ones. In some cases I have observed the mother remain in the same position some time even after all the young larvae have moved away from beneath her body. All this time the parent insect does not take any food and while in this posture the slightest disturbance makes it vibrate the antennae in a characteristic manner as though in defence, and bring its body closer to that side of the eggmass where the disturbance is felt. The eggmass in some cases is fairly big and the parent is not able to cover the whole mass while it sits over it. In one case where I got a group of eggs collected from a tree with

> the mother mounting guard over them, I observed that, while those eggs well covered by the parent's body retained their normal colour, those at the edge and away from the mother's reach developed a dark tinge and eventually, in about two days, minute black wasps emerged from the eggs instead of bug larvae. Evidently the parent resting on the eggmass serves to some extent as a preventive against the eggs getting parasitized."

Pachycoris fabricii (Linnaeus), of the West Indies, was briefly mentioned by H. G. Barber (1925). Mr. Barber has sent me a more detailed account read before the American Association for the Advancement of Science, but apparently as yet unpublished. I quote from this manuscript, with Mr. Barber's permission:

> "While collecting insects in Porto Rico for the American Museum of Natural History, in the summer of 1914, I noticed a specimen of the brilliantly colored female of this species on the under side of a leaf. Spread over the leaf surface were quite a number of the small dark green nymphs, probably in the second instar. I slightly disturbed the leaf, when suddenly to my great surprise the little bugs scurried to the mother, crowding beneath her robust body in order to gain protection. The mother bug seemed perfectly conscious of her duty in the matter and remained stationary, covering them over with her body very much as a hen will hover her chicks. No eggs were found on this particular leaf, so that the brood must wander about in the wake of the mother, at least to some extent. As the nymphs observed were only eight or ten in number, it is quite evident that some of the brood had either gone astray or had perished."

Pachycoris torridus (Scopoli), of Central and South America, was observed by R. F. Hussey (1934) in Paraguay. The female deposits 50 to 150 eggs in a flat plaque on the under side of a leaf and stands guard over them throughout the period of incubation and the first nymphal instar. The plaque of eggs usually occupies an area just about as great as can be covered by the adult bug and, after emergence, the young huddle in a mass under the body of the female. Presocial behavior in *P. torridus* had been observed previously, however, by E. G. Smyth (1919), in Porto Rico.

PENTATOMIDAE.

Meadorus griseus (Linnaeus), of Europe, also variously referred to as *Elasmostethus griseus, Clinocoris griseus, Acanthosoma griseum, Elasmucha interstincta* Reuter, and *Cimex betulae*

Degeer, is the oldest and best-known case of parental care in Hemiptera. It was first observed by Modeer (1764), whose Swedish account was translated into German by Herbst (1786). Carl Degeer (1773 and 1780) studied this insect very carefully, calling it "*Cimex betulae*." Since then it was observed by P. Boitard (1836), E. Parfitt (1865), J. Hellins (1870, 1872, and 1874), F. Reiber and A. Puton (1876), Pierre (1903), H. Schouteden (1903), A. C. Oudemans (1905), W. C. Jensen-Haarup (1916 and 1917), F. Schumacher (1917), E. Nielsen (1920), and T. Schoevers (1925). Most of these observations have been summarized by G. W. Kirkaldy (1903 and 1904), H. Schouteden (1903), R. Heymons (1915), E. A. Butler (1923), and H. Weber (1930). All observers agree that in this species the female guards the eggs after oviposition and remains with the young larvae for as long as 19 days. Not the least interesting behavior of females guarding eggs, is that they do not give off the characteristic bug-odor emitted by the insect under ordinary circumstances.

Phlaeophana longirostris (Spinola) (Syn.: *Phloea paradoxa* Burmeister, 1835) was studied with much detail near Rio de Janeiro, Brazil, by P. S. de Magalhães (1909 and 1910) and by P. Brien (1923 and 1930).[1] The female lives closely applied to the bark of *Terminalia Catappa* Linné, where she readily escapes detection. She covers with her body 8 to 12 eggs; after these hatch the nymphs cling to the under side of her abdomen until they reach the last nymphal stage. Since the proboscis of the early nymphal instars is too short to pierce the bark, these nymphs are probably fed by the mother, either with some substance she excretes or with some of the sap of the tree oozing out along her proboscis.

Phloea corticata (Drury) (Syn.: *Phloea paradoxa* Hahn, 1834), of Brazil, has apparently habits similar to those of *P. longirostris*. J. C. Schiödte (1844) found the young nymphs attached to the venter of the female. A third species, *Phloea subquadrata* Spinola, also of South America, should likewise be investigated.

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[1] Both de Magalhães and Brien name their insect correctly *Phloea paradoxa* Burmeister, 1835 (not of Hahn, 1834). The insect should, however, be known as *Phlaeophana longirostris* Spinola (1837), on account of the earlier *Phloea paradoxa* Hahn (1834), even though the latter is a synonym of *Phloea corticata* (Drury, 1773). P. S. de Magalhães's first account was reproduced by R. v. Ihering (1909), H. Kolbe (1910), and (in English) by R. F. Hussey (1934). His later paper, published in 1910, is, however, much more complete.

Chlorocoris atrispinus Stål (identified by Mr. H. B. Barber).—On February 5, 1931, at the Finca Pacayal near Pochuta (Dept. Chimaltenango), Guatemala, I observed a female of this large green bug (21 mm. long). She was quietly resting on the under side of the frond of a tree-fern grown on the porch of a house. She made no attempt to escape when disturbed and when I caught her, I was much surprised to find fifteen small nymphs hiding under her body. These nymphs were all about the same size (3.5 to 4 mm. long) and apparently in the first instar. They were very quiet, all huddled together in one layer, and so completely covered by the mother, that at first their presence was not even suspected. Since they were sitting over the empty egg-shells, fixed to the frond, it may be surmised that they had recently hatched and had not yet started to feed. This observation shows clearly that the female of *Chlorocoris atrispinus* guards the eggs as well as the young nymphs.

Garceus fidelis Distant was observed by F. P. Dodd (1916), in northern Queensland. He states that the larvae "shelter upon the under side of the abdomen of their parent. I have often met with this bug, but when I did come across a mother with young they were never on the leaf, though I suppose they come down to feed."

Eumecopus.—An unidentified species of this genus was found by F. P. Dodd (1916), in the Cairns district of northern Queensland, staying with ova and larvae.

In the case of *Coctoteris exiguus* Distant, of New Guinea (Kirkaldy, 1903 and 1904; referred to a species of *Spudaeus*? in 1902), and of *Mecitorhinus* (or *Dinocoris*) *tripterus* (Fabricius), of Central and South America (P. Rau, 1918), the evidence is extremely meagre. These insects cannot yet be included among those definitely exhibiting parental solicitude.

ARADIDAE.

According to H. E. McClure (1932), the female of *Neuroctenus pseudonymus* Bergroth, in Texas, lays the eggs in masses of from 10 to 50 in channels burrowed by other insects under the bark of dead trees. She then departs, but another adult crawls astride the eggs and remains there until they hatch. McClure is probably right in his surmise that this second individual is a male, since I found that only the male guards the eggs in the African reduviids, *Rhinocoris albopilosus* and *R. albopunctatus.*

Ctenoneurus hochstetteri (Mayr) was observed by J. G. Myers (1921), in New Zealand. He notes that imagines "are sometimes found carrying several first or second instar nymphs on their backs and sides in a manner comparable to that of Lycosid spiders. Considering the gregarious habit of the species, perhaps we should rule out maternal solicitude as an explanation; but it is significant that these young nymphs do not apparently cling to older nymphs which closely approach imagines in size."

REDUVIIDAE.

In a South American, undetermined species of *Ghilianella*, according to F. Pascoe (1888; quoted by D. Sharp, 1909, p. 556), the linear shape enables the young nymph to be carried about by the adult. The long, slender abdomen of the larva is curled around the thorax of the parent; but the sex of the adult caring for the young is not known. Pascoe's observation was made at Pará, Brazil.

Endochus cingalensis Stål "and allied forms" were observed by E. E. Green (in Kirkaldy, 1904, p. 583), in Ceylon, remaining near their egg clusters until they are hatched. "The young are at first gregarious, and the parent may usually be seen on the same leaf, watching over them like a hen with her chicks. It seems possible that she may catch insects to provide them with food, but I have no evidence of this."

Rhinocoris albopunctatus Stål is a common reduviid in South Central Africa, particularly in the Katanga District of the Belgian Congo. I found it on several occasions, near Bukama and Sankisia, guarding the egg-mass attached to a stem (J. Bequaert, 1912 and 1913).[2] The young nymphs also remain with the adult for some time after hatching. In each case it was the male, not the female, that took care of the offspring. Similar observations were made on the related *Rhinocoris albopilosus* Stål, during my later journey through the northeastern Belgian Congo. At Penge, on the Ituri River, I found, on February 15, 1914, one of these reduviids guarding the eggs as I have described for *R. albopunctatus*. The adult in this case too was a male and most careful search failed to disclose any female near-by. The male was sitting on top of the eggs, none of which were hatched. I succeeded in forcibly pushing him away from the egg-mass, but he always returned to the eggs after a while. When an ant was thrown onto the egg-mass, the male at first moved away, evidently frightened by the moving hand; but he soon returned, carefully exploring with the antennae, until the ant was discovered. The bug then proceeded to attack the ant with the beak and finally impaled it and carried it off an inch or so from the egg-mass, where he dropped it and then returned to the eggs. It seems rather remarkable that parental solicitude has not been reported for any other of the numerous African species of *Rhinocoris*.

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[2] The insects observed in the Katanga in 1911–1912, were originally named *R. albopilosus* Stål and recorded under that name in my two notes of 1912 and 1913. In his recent Catalogue of the Reduviidae of the Belgian Congo (1932, Ann. Musée du Congo Zool., Série II, Section II, I, fasc. 3, p. 171), Dr. H. Schouteden refers all Katanga specimens to *R. albopunctatus* Stål, while retaining the name *R. albopilosus* for the specimens of the Lower, Central and Northeastern Congo. He states, however, that the two species are closely related, which is also brought out by the fact that they exhibit the same presocial behavior.

TINGIDAE.

In two North American species of *Gargaphia*, the female is definitely known to guard the eggs and young nymphs.

D. E. Fink (1915) first observed this behavior for *Gargaphia solani* Heidemann, in Virginia. I quote from his account:

> "The female attends the eggs during the entire period of incubation, leaving them only at intervals to feed, and later, when the nymphs emerge, is constantly in attendance. . . . When migrating from one leaf to another the female adult usually directs the way and with her long antennae keeps the nymphs together or rebukes any straggler or deserter. It is an interesting sight to observe the migration of a colony of more than a hundred nymphs, with the female adult hurrying from one end of the flock to the other, keeping them together and at the same time urging them in the right direction during the migration. . . . On one occasion while observing the feeding of the nymphs, a ladybeetle (*Hippodamia convergens* Guér.) was seen to approach the brood, when the adult lacebug in attendance on the nymphs, with outstretched, slightly raised wings, suddenly darted toward the intruder, driving it from the leaf."

According to observations by H. B. Weiss (1919), in Pennsylvania, and by J. R. de la Torre-Bueno (1935), in New York, *Gargaphia tiliae* (Walsh) has similar habits. Weiss writes: "During the incubation period of the egg, a female lace-bug is always in attendance and each colony of nymphs usually has a female watching over it until the members are full grown."

CYDNIDAE.

Sehirus sexmaculatus Rambur, of Europe, was observed by F. B. Boselli (1932), in Italy. He found that the female lays underground, in a small niche, a compact mass of 100 to 125 eggs which she keeps grasped with the legs. To these she is very devoted, not attempting to escape when disturbed. If removed from the eggs, she appears uneasy until she regains possession of them, when she proceeds to tuck them under her body. The newly hatched nymphs remain with the mother throughout the first stage. Second stage nymphs, however, were found in the open, away from the mother.

GERRIDAE.

The genus *Halobates* is unique among the Hemiptera, in that the nymphs and adults live on the surface of the ocean, away from the coast. Several species have been described, mostly from tropical and subtropical waters. D. Sharp (1909, pp. 552–553) gives an excellent résumé of their habits:

> "When the sea is calm these insects skim over the surface with rapidity, but disappear as soon as it becomes agitated. They are believed to feed on small animals recently deceased; Witlaczil says on the juices of jelly-fish. The young are frequently met with, and there can be no doubt that the whole life-cycle may be passed through by the insect far away from land. The Italian ship *Vestor Pisani* met with a bird's feather floating on the ocean off the Galapagos Islands, covered with eggs which proved to be those of *Halobates* in an advanced state of development. It was formerly believed that the female carries the eggs for some time after their exclusion, and although this has been denied,[3] it is nevertheless an undoubted fact, for it was observed by Mr. J. J. Walker (Ent. Mo. Mag. XXIX, 1893, p. 227) to whom we are indebted for a specimen having the eggs still attached to the body, as shown in Fig. 265. Mr. Walker believes the bugs shelter themselves when the sea is at all rough by keeping at a sufficient distance below the surface; they can dive with facility and are gregarious. They are frequently found close to the shore, and Mr. Walker has even met with them on land."

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[3] V. L. Kellogg (American Insects, 1908, p. 198) says that they "probably attach their eggs to floating seaweed (Sargassum)."

BELOSTOMIDAE.

Lethocerus americanus Leidy, the giant water-bug, seems to exhibit true parental solicitude. According to W. E. Hoffmann (1924), J. R. Parker observed the adults guarding the eggs on the margin of a small slough at Ronan, Montana. When he approached the eggs, the male started for the water; but the female assumed a fighting attitude, with the fore pair of legs extended and ready to strike at anything brought near her.

AEPOPHILIDAE.

Aëpophilus bonnairei Signoret is a peculiar semi-aquatic bug, living under stones on the coast of western Europe, below high-water mark. J. H. Keys (1895 and 1914; reproduced by E. A. Butler, 1923) observed many of its habits. He states:

> "Instinctive solicitude for the young is much in evidence with the species. It was common to see in my breeding cage, on the under side of the stone, a circle of young with an adult in the centre, the heads of the immatures being all oriented towards this centre. On my lifting out the stone, the adult would almost instantly alarm the young with a rapid tap with each antenna alternately, and the whole troop would scamper round to the other side of the stone with great speed."

HOMOPTERA.

MEMBRACIDAE.

There appears to be only one fairly authenticated case of parental care in the Homoptera. According to R. H. Beamer's (1930) observations, in the North American membracid, *Platycotis vittata* (Fabricius), the female sits on a twig some distance below the cluster of small nymphs, which she guards. She was even seen defending them against a wasp.

The supposed case of maternal affection in the North American *Entylia sinuata* (Fabricius), reported by Mary E. Murtfeldt (1887), is discredited by W. D. Funkhouser (1917, p. 398).

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THE IMAGINAL DISCS OF DROSOPHILA MELANOGASTER.

By Hal B. Parks, Austin, Texas.

The location and morphology of the imaginal discs in *Drosophila melanogaster* are presented as this information is not available in literature and will be of aid to those working with this insect.

To enable one to see these discs with the microscope two methods of technique are used. These are the paraffin section and the "in toto" methods. The paraffin method is the same used for any larval material, however the "in toto" method is vastly different from any of the methods found in literature. This consisted of slitting the mature larva down the median dorsal line, evacuating the body cavity fixing the body walls in Carnoy's solution, and later staining in Delafield's Haemotoxylin. When properly done this stains the imaginal discs only, leaving the body wall free from stain.

Various dissections have shown that the imaginal discs of the head and thorax are complete at the time of pupation. The abdominal discs, however, do not become visible until eight to sixteen hours after pupation. They are best seen in the pronymph stage, appearing along the lateral sides as illustrated by figure 2. Sections were made of early larvae in the attempt to discover the origin of these discs, but evidence was not obtained from such sections. Figure 1 represents a pupa eight hours after pupation. Here the abdominal discs are plainly seen. An examination of the cross sections at the bottom of the plate, especially figure 4, shows the abdominal discs lying on and above the larval hypodermis. It is probable, therefore, that the imaginal discs are originally hypo-
('95) for *Eristalis* and *Calliphora,* respectively.
dermal. This opinion was held by Bruno Wahl ('01) and Lowne

Posteriorly, in the last abdominal segment, the genital and rectal disc of the adult is seen (figure 1). According to Bruno Wahl ('01) it is composed of four abdominal discs which have fused; this is comparable with figure 5 in which three parts are shown.

The heavy line around the labial buds (figure IP) and extending down and around the brain represents the inverted pharynx, a part of the first larval segment which forms the adult head. The two buds anterior to the brain are the frontal sacs containing the antenna and the compound eye discs. Ventrally and toward the sides are the three pairs of leg buds. The wing and mesothoracic bud is seen in the second segment.

If one tries to line up all of the imaginal discs of the head and thoracic complex along the outer wall in order to obtain a definite idea of their probable original position in the ectoderm, one meets with some difficulty, especially in trying to use transverse sections (figure 3). If one turns to the diagram given in figure 1, it is found that anteriorly the labial buds and the leg buds are extremely ventral, and the wing and mesothoracic buds are ventral and lateral, but the antenna and the compound eye discs appear to be more dorsal than ventral. This is, of course, a correct way of viewing the situation, because the discs of the proboscis, antennae, and the compound eyes, come from the inverted pharynx, and it is supposed that even if these discs originate from the dorsal side of the pharynx, the original ectoderm from which they were derived was of ventral origin in the embryo. This was shown to be so in a previous paper (Parks, '35).

A little later the total cephalic and thoracic complexes are everted (figure 2). The hypoderm at their bases grows dorsally and ventrally, uniting to form the hypoderm of the adult which will in turn secrete the chitinous exoskeleton. In the abdomen the eight larval segments are condensed to six. The first two fuse to form the first adult abdominal segment, the last two are involved in the genital and rectal mechanism.

The abdominal imaginal discs grow dorsally and fuse on the mid-dorsal line; ventrally they fuse in the region of the sternitals. The genital and rectal discs, of course, form the external genital and anal apparatus.

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PLATE VII.

EXPLANATION OF FIGURE 1.

"In toto" mount of a pupa eight hours after pupation. The pupa was slit down the median dorsal line and the internal organs removed, leaving only the imaginal disc complex.

1 prothorax.

2 mesothorax.
3 metathorax.
AB antennal bud.
LB labial bud.
IP inverted pharynx.
H theoretical position of the humeral bud.
L1 prothoracic leg bud.
L2 mesothoracic leg bud.
L3 metathoracic leg bud.
WMB wing and mesothoracic bud.
CEB compound eye disc.
MD metathoracic disc dorsal.
B brain.
FAS first abdominal segment.
SP spiracle.
VAD ventral abdominal imaginal disc.
DAD dorsal abdominal imaginal disc.
GRD genital and rectal disc.

Explanation of Figure 2.

Pronymph stage showing the everted cephalic complex and the wings and legs. Along the lateral sides appear the dorsal and ventral abdominal discs.

1 { A antenna.
PB proboscis.
CE compound eye. } come from the everted pharynx.
2 mesothorax.
PL prothoracic leg.
WMB wing and mesothoracic bud.
FAS first abdominal segment.
VAD ventral abdominal imaginal disc.
DAD dorsal abdominal imaginal disc.
SP spiracle.

Explanation of Figure 3.

Cross section through the cephalic region of a pupa about the age shown in figure 1.

CEB compound eye disc.
MP muscle plate.
LI prothoracic leg bud.
CU cuticle.
LH larval hypodermis.
WMB wing and mesothoracic bud.

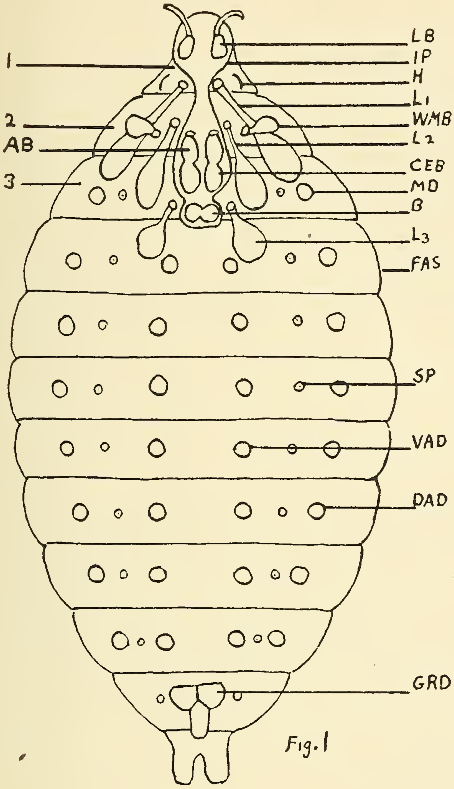
1
2
AB
3
LB
IP
H
L1
WMB
L2
CEB
MD
B
L3
FAS
SP
VAD
DAD
GRD

Fig. 1

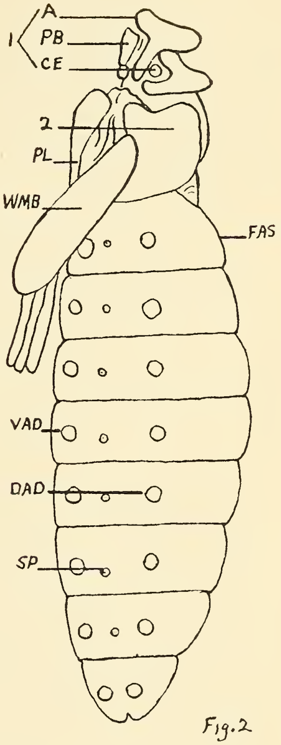
1
A
PB
CE
2
PL
WMB
FAS
VAD
DAD
SP

Fig. 2

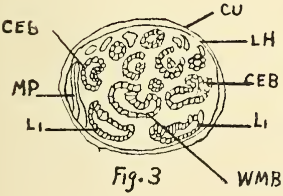
CEb
CU
LH
MP
CEB
L1
L1
WMB

Fig. 3

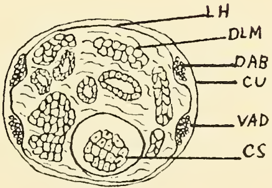
LH
DLM
DAB
CU
VAD
CS

Fig. 4

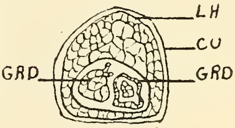
LH
CU
GRD
GRD

Fig. 5

Explanation of Figure 4.

Cross section through the abdomen of a pupa about the age shown in Figure 1.

LH larval hypodermis.
DIM broken down larval material.
DAD dorsal abdominal imaginal disc.
CU cuticle.
VAD ventral abdominal imaginal disc.
CS chyle stomach.

Explanation of Figure 5.

Cross section through the anal region of a pupa about the age shown in Figure 1.

LH larval hypodermis.
CU cuticle.
GRD genital and rectal disc.

Gregariousness in Papilio philenor.—The gregarious and roosting habits of butterflies are well known especially of species of *Heliconius* and *Anosia.* It is not surprising to find other species with similar habits. On June 7 the writer was collecting near Santa Rita near the south line of Brooks County, Texas. Due to copious rains many plants were in full bloom. *Papilio philenor* was in great abundance and seemed to be the only butterfly at work. A local shower passed through the section. Just before the rainfall, not exceeding five minutes, these black butterflies raised from the flowers and headed for a large huisache tree (*Acacia farnesiana*) which stood near a ranch house. The collectors likewise sought the protection of this tree. Forty of these butterflies were counted hanging to the undersides of the limbs. They were clasped to the limbs with the wings down and their heads toward the tree, the thick leaves and branches thus giving complete protection. The ranchman on being questioned about the butterflies stated, that these butterflies came to this one tree not only to escape rain, but also to roost during the night.—H. B. Parks, San Antonio, Tex.

THE GENUS BRUCHOMORPHA NEWMAN (HOMOPTERA–FULGORIDAE).

By E. D. Ball, University of Arizona, Tucson, Arizona.

The small curious barrel-shaped species of this North American genus like those of their relatives in the genus *Aphelonema* are very variable in color. This is especially so in the subtropical regions and has resulted in considerable confusion and synonomy.

Melichar ('06) keyed out eight species. One (*B. globosa*) did not belong to the genus or to North America but was from Liberia, Africa, leaving seven North American species which he separated almost entirely on color. His material was limited and mostly from the more northern regions where the colors are more stable, but even then the results were not satisfactory.

Metcalf ('23) added five new species and gave a key to twelve. He omitted *mormo* Kirk. and redescribed it as *minima*—and his *vittata* and *bicolor* were taken together and proved to be long and short winged forms of the same species. His *dorsata* is not that of Fitch.

Dozier ('28) distributed a publication variously dated 1922 and 1926, but actually distributed about July 1, 1928. In this he redescribed *jocosa* Stål as *bimaculata* and gave a color key to eleven species. He evidently lacked material as much of the information was apparently copied from previous descriptions.

The writer has recently studied examples of all the described species including several hundred collected in Florida, Texas and Arizona. These subtropical representatives exhibit variations in color in what is apparently the same species from pale yellow through straw and pale red to definitely black striped, brown and even totally black forms, indicating that in subtropical material at least color can not be used as a major differentiating character. The following key is based mainly on structural characters and only uses color to assist in placing the more stable temperate region forms.

Key to the Species of Bruchomorpha.

A—Elytra with the venation obscure, the nervures concolorous with the membrane.
  B—Nasal protuberance short not as long as wide.
    C—Species very broad, highly iridescent, black.
1. *tristis* Stål
    CC—Species normal, barrel shaped.
      D—Frontal tablet oval, widest near the middle.

E—Frontal tablet very broad, 2/3 as wide as long—species black . . . . 2. *mormo* Kirk.
EE—Frontal tablet elongate, not as wide as long, species with three stripes . . . . 3. **triunata** Ball
DD—Frontal tablet top shaped, elongate below.
F—Species usually reddish or pale, sometimes with dark lateral stripes, rarely all dark without a dorsal stripe.
G—Nasal protuberance (as seen from side) as long as broad . . . . 4. *vittata* Metc.
GG—Nasal protuberance (as seen from side) very short and broad . . . . 5. *jocosa* Stål
FF—Species black with a broad dorsal light stripe.
H—Stripe extending from tip to tip . . . . 6. *dorsata* Fh.
HH—Stripe extending only to end of elytra or one segment beyond.
I—Front in profile straight or rounding at tip.
7. *pallidipes* Stål
II—Front in profile slightly elevated before apex.
8. *suturalis* Melic.
BB—Nasal protuberance long, as long as or longer than its width at the constriction . . . . 9. *oculata* Newm.
AA—Elytra with the venation coarsely reticulate, the nervures pale or yellow.
J—Front broadly oval nasal protuberance very broad and short.
10. *decorata* Metc.
JJ—Front long and slender, nasal protuberance narrow.
11. *rugosa* Metc.

1. *Bruchomorpha tristis* Stål.

This is the shortest, broadest species of the genus and is always iridescent black. The writer's material is all from northern and mountain regions from Ontario and New York through Wisconsin, Iowa, Dakota, Colorado, Montana and Oregon, south in California to Dunsmuir and in Arizona to Oak Creek Canyon. The writer did not take it in Florida and has not taken it in Arizona below the yellow Pine Belt.

2. *Bruchomorpha mormo* Kirk.
(*Bruchomorpha minima* Metc.).

This small shiny black species is common in southern Arizona and can be distinguished by its broadly oval front. This is probably the species Metcalf described as *minima* from N. C. His figures show the nasal process produced but his description says "not produced."

3. **Bruchomorpha triunata** Ball n. sp.

A small shiny black species resembling *tristis* but with three broad white stripes and a very narrow front widest in the middle. Length 1.6 mm.

> Front a long oval abruptly pointed below. Much narrower than in *mormo* and not top shaped as in most species; the disc flat or concave, the bounding carinae light, the median one faint. Nasal process even shorter and broader than in *dorsata*, strongly carinate. Color black, a broad white stripe from apex of front across the first exposed abdominal segment, as wide as frontal carinae at the vertex. A pair of oblique white stripes broadly covering the lower half of clypeus and gradually narrowing to beyond the middle of the elytra. A pair of white crescents arising under the lateral margin of the elytra and curving around to the genitalia. The pustules and legs pale.

Holotype, ♂, Patagonia, September 10, 1933. Paratype male and a female nymph, Nogales, July 13, 1934. Taken by the writer sweeping range grasses.

4. *Bruchomorpha vittata* Metcalf.
(*Bruchomorpha bicolor* Metc.).

A slightly larger and more definitely striped species than *jocosa*, with a much longer nasal protuberance. Known only from Brownsville, Texas, where the writer took it in abundance January 2, 1932, including the long-winged form. Metcalf described this species as *bicolor* but on a previous page he had described the long-winged form taken with it as *vittata*, evidently not recognizing that all long-winged forms have practically the same dark color and that they all have much enlarged mesonotal protuberances and consequently notched pronotums. The form of the nasal process is however distinctive.

5. *Bruchomorpha jocosa* Stål.
(*Bruchomorpha bimaculata* Doz.).

A small compact barrel-shaped species with a very short broad projection and top-shaped front. Color reddish or rusty straw with a black mark on the "nose" and another on the genitalia, the male with the lower part of the elytra obliquely black, in sharp contrast. Melichar, Metcalf and Dozier all treat *jocosa* as entirely pale reddish with the black "nose" but Stål in his original description of the male says "tegminibus, parte commissurali excepta—

nigris," thus covering *bimaculata* of Dozier. This form is abundant throughout the Gulf region and is occasionally taken as far north as Virginia, Iowa and Nebraska.

KEY TO JOCOSA VARIETIES.

A—Females red or pale sometimes with a lateral dark stripe.
  B—Female all reddish or pale .... 1. var. *jocosa* Stål
  BB—Female reddish or pale with a lateral dark stripe.
    2. var. **craniata** Ball
AA—Females (and males) all dark (or with only a trace of light stripes) .... 3. var. **obscura** Ball

Var. **craniata** Ball n. var.

Resembling *jocosa* usually, but definitely larger and longer, with less of the "barrel" shape. A broad creamy median stripe from tip to tip covering all the space between the lateral carinae on front and pronotum. Outside of this on either side a still broader pair of smoky or almost black stripes arising on the black "nose" and usually omitting the margins of the abdomen. Legs and below reddish.

Holotype ♀, allotype ♂, and seven paratypes, Onaga, Ks. (Crevec.); five paratypes, Stratton, Neb., and one each, Ames, Ia., and Spring Green, Wis.; all, except those from Kansas, collected by the writer. This form might easily be confused with *vittata* but the short nose will separate it.

Var. **obscura** Ball n. var.

Form and size of *jocosa,* almost uniformly dark smoky or rusty brown sometimes almost black with the legs and lower part reddish. The males often show a more or less definite dorsal light or reddish line.

Holotype ♀, allotype ♂, and ten paratypes, Sanford, Florida, taken by the writer. This dark form is common in the winter period from Florida to Mississippi and has been taken as far north as New Jersey, D. C., and Virginia. It has, however, never before been recognized as a color phase of *jocosa.*

6. *Bruchomorpha dorsata* Fitch.
(*Bruchomorpha flavo-vittata* Stål).

An exceedingly short nosed black species with a broad white stripe from tip to tip. The feet are usually pale. A northern species ranging from New York and North Carolina to Dakota and Kansas.

7. *Bruchomorpha pallidipes* Stål.

Similar to *dorsata* but with the dorsal stripe ending on the first visible abdominal segment. Probably only a variety of the above.

8. *Bruchomorpha suturalis* Melich.

Resembling *pallidipes* except that the stripe is often narrower, the end of the "nose" is elevated and the front sinuated—this is probably only a variety of *dorsata* as suggested by Melicher. It appears to be the most abundant form in Colorado and northern Arizona.

The writer is inclined to believe that the three preceding species are all forms of *dorsata,* the first described. His material, however, is limited, having only about 50 examples of the three. In other species where the examples run into the hundreds it has been possible to determine the limits of normal variation with more accuracy. It is even possible that *dorsata* and its variations represent the temperate region expression while *jocosa,* and its varieties, are the subtropical representatives of a single abundant and very variable species. If these two groups were united then all the known species would have definite structural characters on which they could be readily separated.

9. *Bruchomorpha oculata* Newman.

The long nasal protuberance will at once separate this species from any other, but it is widely distributed, occurring from the Atlantic to the Pacific and from Canada to Mexico and highly variable in size and color and to a less extent in form. It can only be adequately treated by considering the following varieties:

KEY TO THE VARIETIES OF OCULATA NEWMAN.

A—Body black, no dorsal stripe or at most a narrow rusty one on carinae of front.
  B—Legs reddish or yellowish .... 1. var. *oculata* New.
  BB—Legs black, size small, nasal protuberance narrow. 2. var. **nigrata** Ball
AA—Body black, a broad white dorsal stripe.
  C—Dorsal stripe extending to apex of abdomen. Nose broad. 3. var. **extensa** Ball
  CC—Dorsal stripe fading out on abdomen.
    D—Legs yellow—nose broad .... 4. var. *nasuta* Stål
    DD—Legs black in female—nose narrow 5. var. **abrupta** Ball

1. *B. oculata-oculata* Newman is very dark with a definite red-

dish cast accentuated on the legs and below; the stripe is narrow and reddish or absent. This is the dominant form in the northern states and Canada.

2. *B. oculata*-**nigrata** Ball n. var.

Form of *oculata,* smaller, darker, with legs black and the nasal protuberance long and narrow. Holotype ♀, allotype ♂, and eight paratypes Sanford, Florida, taken by the writer. This form almost entirely replaces *oculata* in the Gulf region and is abundant during the winter season.

3. *B. oculata*-**extensa** Ball n. var. (*B. dorsata* of Metc. not Fitch).

Form of *oculata* nearly slightly larger, the nasal protuberance more foliaceous, the dorsal stripe very broad, creamy and extending from apex of front to apex of abdomen. Holotype ♀, and four paratype females, Granite Dell, Arizona, July 6, 1929. Allotype ♂, and one paratype male, Ashfork, Arizona, August 16, 1929. This is the form illustrated by Metcalf, as *dorsata* but is quite different from that short headed species. It is found sparingly in the Gulf region and extends through to southern California and north into Utah.

4. *B. oculata-nasuta* Stål.

This large dark form, with the broad stripe running back to the first visible abdominal segment and the striking red legs; is northern in distribution and particularly abundant in the Rocky Mountain region from Canada to Colorado.

5. *B. oculata*-**abrupta** Ball n. var.

Form of *nasuta* nearly, larger with a narrower rounder nasal protuberance. Black with black legs in the females and black or dark red ones in the males, the dorsal stripe is definite but narrower and reddish and often does not extend onto the abdomen. Holotype ♀, allotype ♂, and eight paratypes taken by the writer at Sanford, Florida. This is a fairly common summer form in the Gulf region.

10. *Bruchomorpha decorata* Metcalf.

A short stout strikingly distinct species by the coarsely reticulate elytra and the broad nasal protuberance. Color very variable, mottled yellow (or pale) and dark. The writer has taken this species at Brownsville, Texas, and in the Baboquivari Mountains in Arizona and has material from Cuernavaca, Mexico. It appears to be strictly confined to a single species of grass, the Arizona fox-tail (*Chaetochloa grisebachii*) as a food plant.

11. *Bruchomorpha rugosa* Metcalf.

Resembling a very small *Fitchiella robertsoni* in the reticulate elytra and linear markings on the abdominal segments, thus strikingly distinct in this group. The anterior tibiae are slightly dilated and it may be necessary to transfer this species to *Fitchiella.*

Described from Brownsville, Texas, and Nogales, Arizona. The writer has taken it on range grasses in several places in Southern Arizona.

ENTOMOLOGICAL OBSERVATIONS AT HARTSDALE, N. Y.

By Geo. P. Engelhardt, Hartsdale, N. Y.

The outstanding feature of this suburban section of New York City is that there have been no insect outbreaks of major importance during 1935. The fall cankerworm, so very troublesome in past seasons, has gradually diminished into insignificance. Of the Japanese beetle only isolated cases have been reported so far. The Asiatic beetle, on the other hand has been holding its own, exacting its usual toll in gardens and lawns.

Among the Lepidoptera it is of interest to record the great abundance of the butterfly *Enodia portlandia* Hbn. More than 50 specimens were easily netted in the woodland adjoining Greenridge, Hartsdale, N. Y., in early July. Their abundance continued during this month. This butterfly is well-established locally in wooded sections of the Hudson River region in the vicinity of New York City; and its range extends far to the north and south, yet it can hardly be designated as a common species. It does not occur on Long Island and, according to Wm. T. Davis, is not found on Staten Island.

THE GENUS COLEOMYIA (DIPTERA–ASILIDAE).

By J. Wilcox and C. H. Martin, Washington, D. C.

The genus *Coleomyia* is here erected to include *Metapogon setiger* Cole and related species. These small robber flies are considered rare and heretofore have been known only from the far western States; *setiger* was described from Oregon; Melander records it from Oregon, Washington, California, and Idaho. Three species are described here as new and representatives of several other species are at hand that greatly extend the range of the genus but are not described because of lack of sufficient material in good condition; one was collected in North Carolina (Summit, Craggy Mts., Aug. 10, 1906, Wm. Beutenmueller), another in Colorado (Estes Park, July, 1892, F. H. Snow), several from Montana (Bozeman, July 11, 1928), and several from California (Meadow Valley, Plumas Co., 4,000–5,000 feet, VII–8 and 11, '24, E. C. Van Dyke).

The species for the most part are taken at high elevations, although *C. setiger* (Cole) occurs nearly at sea level. They are found resting on the ground, on logs, on the trunks of trees, and occasionally on the leaves of broad-leaved trees and shrubs, usually in open spots in the coniferous forests. At Puyallup, Wash., *setiger* was taken in a small clearing along with *Cophura brevicornis* Williston; the latter species, however, was the most abundant.

Coleomyia is most closely related to *Metapogon* but is markedly different from that genus. The face, front, and head are narrower; the mystax is composed of very stout, sparse, slightly proclinate bristles; the third antennal joint is short, but slightly longer than the first two joints together; the one-jointed style is minute, cylindrical, and much shorter than the first joint. The thorax is convex but not at all highly arched or compressed anteriorly as are typical *Metapogon;* the third vein is branched beyond the discal crossvein, while in typical *Metapogon* it is branched before the discal crossvein. The body all over is much less pilose.

The writers are indebted to Dr. F. R. Cole, who has kindly criticized the manuscript and examined some of the specimens; and to the Oregon State College, the Ohio State Museum, the Montana State College, the California Academy of Sciences, and Dr. R. H. Painter for the loan of specimens. The types of the new species are in the senior writer's collection and, unless otherwise stated, the paratypes are in the writers' collections.

Coleomyia n. g.

Small black species with the head, thorax, and abdomen pollinose. Head slightly less than twice as broad as high, eyes nearly twice the width of the face below the antennae. Face slightly diverging below, front diverging from the antennae and narrowed at the vertex, only slightly wider at vertex than at antennae. Vertex excavated, ocellar tubercle prominent. Face slightly convex, mystax composed entirely of sparse, strong, slightly proclinate bristles, reaching from the oral margin nearly to the base of the antennae. First and second antennal joints subequal, only slightly longer than wide; third slightly longer than the first two joints together, widest at or beyond the middle, from which it narrows on the lower side to the apex. Style very short, cylindrical, about twice as long as wide, slightly wider at base than at apex, apex with a short, minute seta. First antennal joint usually with two strong bristles below, second joint with one below, and the third joint bare, faintly pollinose on the inner side. Thorax pollinose, slightly arched and convex, with well developed bristles on the dorsum (five dorsocentrals except in *hinei,* where they are lacking). Scutellum pollinose on the dorsum and with two strong, erect marginal bristles. Abdomen of male nearly parallel sided, slightly tapering apically. Dorsum with sparse, minute hairs and a well developed row of lateral bristles on the first segment in both sexes; pollinose at least on the posterior angles of most segments. Genitalia small and inconspicuous, surstyli most prominent. Female abdomen more tapering, ovipositor small with a circlet of spines at the apex. Legs black, only moderately stout, femora without bristles except a short subapical one on the posterior-dorsal surface, but with some appressed pile on the dorsum and a few straggly hairs on the ventral surface. Tibiae and tarsi with strong bristles, claws strong and black, pulvilli present. Coxae pollinose and pilose, usually with some weak bristles. Wings with all the posterior cells open, anal cell narrowly open, discal cell about three times as long as wide with the anterior crossvein slightly before the middle, third vein branched beyond the discal crossvein, costa fringed with setae, posterior margin with a delicate fringe.

Genotype: *Metapogon setiger* Cole.

Cole[1] in his description of *setiger* says, "This species might be made the type of a new genus. The mystax is composed of strong bristles, and in the typical *Metapogon* it is composed chiefly of fine pile. The head is hardly as wide as the typical form, and the face more widened below. The thorax is not highly arched, but more like that of *Lestomyia*."

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[1] Cole, F. R., and Lovett, A. L., 1919. New Oregon Diptera. Proc. Calif. Acad. Sci., 4th series, vol. IX, no. 7, p. 235.

The genus is named in honor of Dr. F. R. Cole, who suggested its erection, and who has done so much work in Diptera, especially of the West, in recent years.

KEY TO THE SPECIES.

MALES:

1. Basal two-fifths of the wings distinctly milky white, infuscated apically 2
Wings hyaline, at most slightly white at base and faintly infuscated apically 3
2. Lateral bristles on the first abdominal segment white, dorsocentral bristles strong, usually four hypopleural bristles. *setiger* (Cole).
Lateral bristles on the first abdominal segment black, dorsocentral bristles absent, usually two hypopleural bristles. **hinei** n. sp.
3. Lateral bristles on the first abdominal segment white, knob of the halteres yellow, basal one-fifth of wings white. **rainieri** n. sp.
Lateral bristles on the first abdominal segment black, knob of the halteres wine red, wings entirely hyaline **sculleni** n. sp.

FEMALES:

1. Lateral bristles on the first abdominal segment black 2
Lateral bristles on the first abdominal segment white 3
3. Dorsocentral bristles strong, knob of halteres red. **sculleni** n. sp.
Dorsocentral bristles absent, knob of halteres yellow. **hinei** n. sp.
3. Hypopleural bristles one to two, pollen of the face silvery, posterior margin of the scutellum black, bare of pollen. **rainieri** n. sp.
Hypopleural bristles three to four, pollen of the face golden, scutellum including the posterior margin usually entirely pollinose .... *setiger* (Cole).

Coleomyia setiger (Cole).

Metapogon setigerum[2] Cole, Proc. Calif. Acad. Sci., 4th series, v. 9, no. 7, pp. 235–236 (Plate 17, fig. 17), 1919.
Metapogon setiger Melander, Psyche, v. 30, no. 6, p. 211, 1923.
Metapogon setiger Cole, Pan-Pacific Ent., v. 1, p. 9, 1924.

The original description and figures amply characterize this species. Type locality: Dee, in the Hood River Valley, Oregon, August 1, 1917 (L. Childs). Cole at the time of description also had specimens from Joseph Oreg.; Mt. Jefferson, Oreg., July 15, 1907 (J. C. Bridwell); and Sherwood, Oreg., July 29. An examination of the specimens from Sherwood and Joseph, Oreg., in the collection of the Oregon State College, shows the specimen from Joseph to be **hinei** new species.

Melander records this species from Washington, Idaho, Oregon, and California. Specimens at hand are from the following additional localities:

Oregon: Portland, July 29, 1930 (R. E. Dimick); Crater Lake, August 2 (W. J. Chamberlin); Cascadia, IX–6 '32 (Wm. W. Baker); Grants Pass, VI–26 (F. M. Hull) in Dr. Painter's collection; Smith River, Douglas County, IX–14 and 15, 1932 (D. K. Frewing); Scotsburg, Douglas County, IX–19 '32 (D. K. Frewing); and Mt. Hood National Forest, Sherwood Forest Camp, VII–17 '32 (Wilcox).

Washington: Puyallup, July and August, 1932 and 1933 (Baker and Wilcox); Tacoma, VII–4 '33 (Baker); Summit Lake, 12 miles west of Olympia, VIII–16 '31 (Wilcox); Forks, VII–23 '33 (Wilcox); Mt. Rainier, Carbon River Entrance, VIII–7 '32 (Wilcox); and Olympia, VIII–29 '32 and IX–11 '33 (Martin).

Coleomyia hinei n. sp.

Male: Length 8 mm. Face, frons, vertex, and upper occiput golden pollinose; lower occiput silvery pollinose; palpi and proboscis black. Bristles of the face black; four small bristles on each side of center of frons and five stronger bristles on each side near the orbits; four strong ocellar bristles and two weaker ones; three strong bristles on each side of the upper occiput and numerous smaller ones; beard and pile of palpi and proboscis weak and gray in color. First and second antennal joints subequal, second wider apically than the first; third slightly longer than the first two together, widest at the apical three-fourths; first joint with one strong and one weak bristle below, second joint with one strong bristle below.

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[2] The specific name was originally given as *setigerum*; Melander changed this to *setiger,* and the writers in the original manuscript changed it to *setigera.* According to Dr. Harold Morrison, Division of Identification and Classification of Insects, Bureau of Entomology and Plant Quarantine, *setiger* is grammatically correct.

Thoracic dorsum densely golden and brown pollinose; central brown stripe bisected by a narrow, setulose, golden pollinose line; central stripe separated from broad lateral brown stripes by a golden pollinose curved line originating in back of the humeri; posterior callosities and dorsum of scutellum golden pollinose. Neck with three medium strong black bristles on each side and some pale hair; pronotum with one strong black bristle and some smaller ones; humeri with several short black bristles and hairs; a thick patch of short black hairs on the brown pollinose spot between the humeri and the dorsocentral row of short black hairs, no dorsocentral bristles; several scattered short black hairs posterior to humeri; two strong presutural bristles; one strong intraalar, and one strong postalar and several smaller black bristles and hairs. Posterior margin of scutellum shining, with two moderately strong bristles about one-half as long as in the other species, and noticeably convergent; and several smaller black hairs. Pleura silvery-golden pollinose, mesosternum below black, metasternum with a smaller distinct spot; pleura bare except for the three black hypopleural bristles.

Dorsum of abdomen subshining black and black setulose, except hind angles of segments 1 to 5, which are silvery pruinose, and the hind angles of segment 6, which are golden pollinose; pollen broad on the sides of the first segment, barely perceptible on the second, and increasing in extent to the fourth; the fourth, fifth, and sixth equal; four strong lateral black bristles and some moderately long black hairs on the first segment. Hypopygium inconspicuous, black and black pilose, brown ventrally. Venter of segments 1 to 3 silvery pollinose; posterior margins of segments 4 and 5 silvery pollinose; venter otherwise black and black setulose.

Coxae silvery pollinose, some short and long black and white hairs on the fore and middle coxae; hind coxae black setigerous and with two weak bristles on the anterior side, rest of legs dull black except on the under side of the apical half of the fore and hind tibiae, which are covered with short, thick brown pile. Claws black, pulvilli dark.

Halteres at base and basal half of stem brown, knob and upper part of stem lemon yellow. Alulae yellowish with white edge and weak white fringe. Basal half of wings milky white, apical half infuscated. Veins in basal half, except costa and part of first vein, light tan, apically dark brown. Anterior cross-vein slightly before middle of discal cell.

Female: Length 9 mm. Similar to male; only one strong bristle below on the first antennal joint; abdomen dull black, except the posterior angles of segments 1 to 5, which are silvery pollinose, segments 6 and 7 shining black; ovipositor small, shining black, apex with light hairs and four strong reddish colored spines on each side. Wings uniformly infuscated, veins brown, anterior cross-vein before middle of discal cell. Pulvilli somewhat paler than in male.

Holotype: Male, Antelope Mt., Harney County, Oreg., elevation 6,500 feet, July 25, 1931 (D. K. Frewing).

Allotype: Female, same date, August 13, 1931.

Paratypes: More than one hundred specimens from the following localities; type locality July 21 to August 17, 1931, and August 13, 1932 (Grant County) (D. K. Frewing); Strawberry Mt., Grant County, Oregon, elevation 8,600 feet, August 21 to September 2, 1932 (D. K. Frewing); Anthony Lake, Blue Mountains, Oreg., elevation 7,100 feet, August 7, 1929 (H. A. Scullen), two of these in the Ohio State Museum; Joseph, Oreg. (see note under *setiger* Cole), a single specimen in the collection of the Oregon State College; Wallowa Lake, Oreg., September 9, 1932 (Itol J. Wilcox); Emigrant Park, Blue Mts., Oreg., VIII–14 '34 (Wilcox); Alpha, Idaho, Long Valley, elevation 4,700 feet, VI–24 to VIII–10 '34 (C. H. and D. Martin).

The Anthony Lake specimens were questionably determined as *setiger* Cole by the late Prof. James S. Hine, in whose honor this species is named.

Coleomyia sculleni n. sp.

Male: Length 9.5 mm. Face, frons, vertex, and occiput entirely silvery pollinose. Bristles black, five weak lateral frontal bristles, four strong ocellars, four strong and about ten weaker ones on each side of the upper occiput; beard and hairs of palpi and proboscis gray. First and second antennal joints equal, third slightly longer than the first two together, style short and narrow, with a minute apical hair; two strong bristles below on the first segment, and one strong bristle below on the second.

Thoracic dorsum entirely silvery pollinose with a suggestion of a broad dark central geminate stripe. Bristles black, strong; two small humeral, five dorsocentral, one posthumeral, two strong presutural, one strong intraalar, and one strong and one weak postalar. Dorsum of scutellum silvery pollinose, with two strong marginal bristles. Pleura and coxae silvery pollinose, mesosternum broadly black below, metasternum with a small black spot. One weak black bristle on one side of neck and some yellowish hairs; pronotum with one strong black bristle and several smaller black ones plus a few weak light hairs; coxae with weak, short, appressed hairs; and three moderately strong black hypopleural bristles.

Dorsum of abdomen black, subshining, with very short appressed black hair, white on sides; first segment entirely silvery pollinose except central posterior portion; second mostly black, with narrow posterior silvery pollinose band broader in the middle than on the sides; third similar, central portion broader; fourth with central pollinose portion reaching nearly to the anterior margin; fifth and sixth entirely pollinose except lateral anterior angles; seventh retracted segment similar; segments 2 to 6 narrowly shining black on the central posterior margin; first segment with three strong black lateral bristles and one weaker yellowish bristle. Hypopygium small, black, ventrally reddish brown. Venter of segments 1 to 6 silvery pollinose and with short white hairs, seventh black with black hairs.

Legs black, bristles and short stiff hairs and claws black; pulvilli yellowish white. Some thick, short, golden pile on the apical one-third of the ventral surface of the hind tibiae and tarsi, especially the metatarsi; fore tibiae and tarsi and middle tarsi similar.

Halteres with base and stem dark brown, stem just before knob light brown, knob red. Alulae tan with white margin and fringe. Wings hyaline, veins brown except that at the extreme base they are lighter colored brown; anterior crossvein slightly before the middle of the discal cell.

Female: Length 8.5 mm. Similar to male. Head and thorax golden-silvery pollinose. Abdominal segments 1 to 5 black, subshining, with narrow posterior silvery pollinose bands interrupted in the middle. Segments 6 and 7 and dorsum of ovipositor shining black. Three strong black bristles on one side of the first abdominal segment and four on the other plus the long white hairs. Wings very lightly infuscated, veins entirely brown.

Holotype: Male, Lake of the Woods, elevation 4,500–7,500 feet, Klamath County, Oreg., July 20, 1930 (H. A. Scullen).

Allotype: Female, Crater Lake, south rim, 7,100 feet elevation, Oreg., July 29, 1930 (H. A. Scullen).

Paratype: One male from the same locality as the holotype (July 21, 1930) differs from the holotype in having three scutellar bristles.

Dedicated to Prof. H. A. Ccullen, who collected this species and has supplied many specimens of Diptera from his collecting trips, especially in Oregon.

Coleomyia rainieri n. sp.

Male: Length 8 mm. Face, frons, vertex, and occiput gray-silvery pollinose; palpi and proboscis black. Bristles black; one or two small bristles on each side of the center of the frons, and four or five stronger lateral ones; four strong ocellar and two posterior smaller ones; at least five strong and four weak ones on the upper occiput; beard and hairs of palpi and proboscis gray. First two antennal joints equal, about as broad as long, third joint one and one-fourth times the length of the first two joints together; style short, cylindrical, nearly twice as long as wide, with an apical minute hair, first joint below with one strong bristle and one weaker one, second with one strong one below; third bare, thinly golden pollinose on the inner surface.

Thoracic dorsum uniformly densely silvery pollinose with but a mere suggestion of the central and lateral dark lines. A row of very small hairs down the center of the dorsum and a lateral row on either side of the central stripe. One pale bristle and several pale hairs on either side of the neck, and one pale bristle and pale hairs on the pronotum; humeri with two moderately strong black bristles and several minute black hairs, one strong posthumeral and two strong presutural, one strong intraalar, and one strong and one weak postalar, five or six strong dorsocentrals. Scutellum densely silvery pollinose, posterior margin narrowly black, with two strong bristles and some minute hairs on posterior margin. Pleura silvery pollinose with a trace of gold on the mesopleura; mesosternum below black and metasternum with a smaller, indefinite, black spot; pleura bare except for the three hypopleural bristles, two pale and one black on one side and one pale and two black on the other, the pale bristles being weaker than the black ones.

Abdomen black with short, pale, appressed hairs and pruinose markings. Broad posterior margin of first segment and the narrow posterior margins of segments 2 to 6 dull black; pruinose markings on the first segment wide on the sides and very narrow in the middle, posterior margins of segments 2 to 4 broadly pruinose with a narrow central wedge, which on segments 3 and 4 each reach the anterior margins, segment 5 with a broader pruinose band and a wider pruinose wedge reaching the anterior margin, segment 6 entirely pruinose except narrow anterior angles, narrow seventh segment entirely black; four strong white lateral bristles and numerous white hairs on the first segment. Venter uniformly silvery pollinose and sparsely covered with short, white, appressed hairs; hypopygium shining black and black hairy, except hypandrium, which is brown tipped with short light hairs.

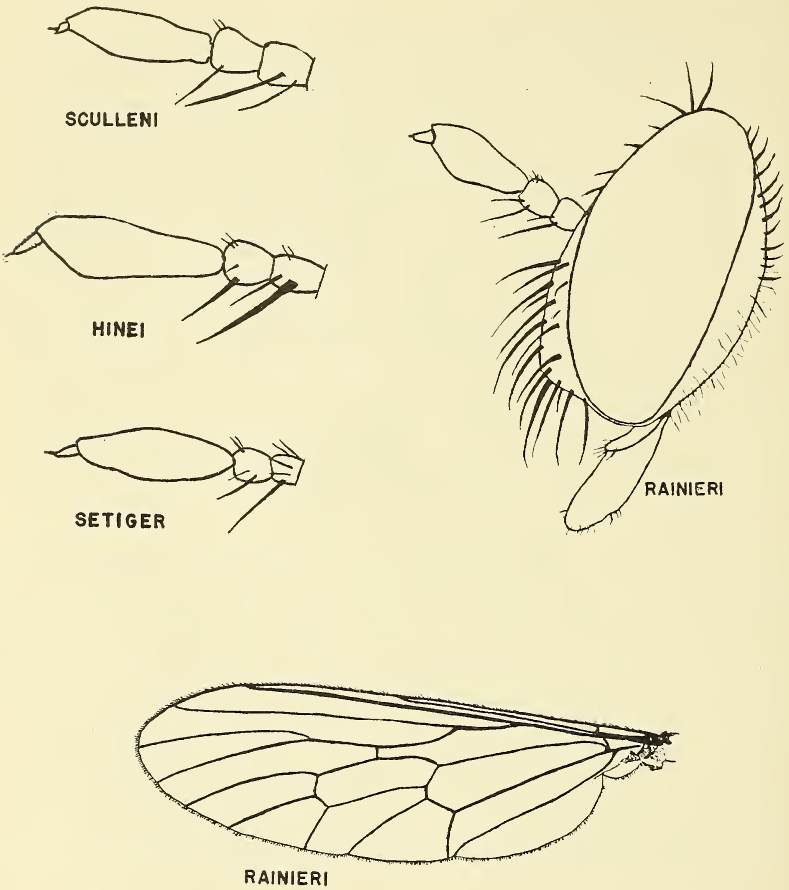

Figure 1. The antennal joints of *Coleomyia sculleni, C. hinei,* and *C. setiger;* the head and wing of *C. rainieri.*

Legs black, except coxae, which are silvery pollinose and with white hairs and bristles; bristles and hairs black except a few pale straggly hairs on the underside of the femora and on the underside of apical half of the fore and hind tibiae, which are brown pilose. Femora without strong bristles, claws black, pulvilli dark.

Base and lower stem of halteres brown, knob and upper stem yellow. Alulae light tan with pale edge and fringe. Basal fourth of wings milky white and veins in this portion light brown; remainder of the wings hyaline, except the tip, which is lightly infuscated, veins dark brown. Anterior crossvein slightly before the middle of the discal cell.

Female: Length 8 mm. Similar to male. Thoracic dorsum mostly brownish pollinose, central stripe divided by a setulose silvery pollinose line; lateral brown stripe apparent; two black hypopleural bristles. Abdomen black and short, white, hairy, with pruinose markings on the posterior margins of segments 1 to 6, broadly interrupted on segments 1, 5, and 6, and narrowly interrupted on segments 2 to 4; segments 6 and 7 more shining. Ovipositor short, shining black with pale hairs and dark spines at the apex. Wings hyaline, veins brown, anterior crossvein before middle of discal cell.

Holotype: Male, Sunrise, elevation 6,300 feet, Mt. Rainier, Wash., August 13, 1931 (Wilcox).

Allotype: Female, same data.

Paratypes: Males and females, four with same data as types; others collected in the type locality as follows: VII–31, VIII–5 and 24 '32 (C. H. and D. Martin), VII–27, VIII–27 and 28 '32 (Wilcox), and VII–27 '33 (Martin). The paratypes range as small as 6 mm. in length; the pruinose bands on the second and third abdominal segments of some of the females are entire.

Some difficulty was experienced in finding characters by which to separate the females of this species from *setiger.* The characters in the key are constant for the specimens at hand.

Dione vanillae on Passiflora tenuiloba.—The relationship between butterflies of the families Heliconiinae and Nymphalinae and plants of the family Passifloraceae is well known; however more specific information is needed. On June 7 a worn female of *Dione vanillae* L. was observed hovering over a small clump of mesquite bushes and acted as if she were depositing eggs. Nothing that looked like passion flower was at hand, but the butterfly persisted. A close examination was made and hidden within the mass of mesquite brush was a very thick growth of *Passiflora tenuiloba* Engelm. This little known passion vine, which has the most peculiar leaves of all that group of plants, was in great abundance on the ground and through the brush. Upon it were probably one hundred larvae of *Dione* ranging from the first instar up to those just ready to pupate. From observations made it is very probable that all of these larvae were from this one progenitor.—H. B. Parks, San Antonio, Tex.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

LOCALITY LABELS.—60c per 1000, 5 in strip, 1 to 3 lines. 5 sizes type. 3½ point, 75c per 1000. Good heavy paper. Prompt service. A. L. Stevens, 691 Culver Rd., Rochester, N. Y.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

WILL COLLECT for cash all ORDERS OF INSECTS, providing I receive sufficient orders prior to collecting to justify my proceeding. Have many specimens in stock at all times for sale. Louise Knobel, Hope, Arkansas.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

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SYNOPSIS OF LEPIDOPHORUS (COLEOPTERA, CURCULIONIDAE).

By L. L. Buchanan, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

The present paper is largely an outgrowth of work done on the identification of specimens received from Mr. W. W. Baker, of the Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

Lepidophorus Kirby (*Lophalophus* Leconte, new synonym).

Lepidophorus is monobasic, established for *L. lineaticollis* Kby.; *Lophalophus* is monobasic, for *Liophloeus inquinatus* Mann. *Lophalophus* cannot very well be maintained unless *Lepidophorus* be divided into a number of subgenera, one of them *Lophalophus*.

The principal characters of *Lepidophorus* are: Rostrum short and stout; mandibles without scar, prominent and tapering down to a thin distal edge which is often subangulate in front and at sides; scrobe lateral, originating near apex of rostrum, more or less broadly visible from above apically, becoming rapidly shallower posteriorly; scape long, reaching across middle of eye to or slightly beyond its hind margin, first funicular segment considerably longer than second; scutellum small or invisible; elytra with rounded humeri and 10 striae, subapical callus absent (except in *alternatus*); functional wings wanting; second abdominal sternite subequal to or longer than third plus fourth.

These characters are practically duplicated in *Dirotognathus* Horn, a genus placed in the Otiorhynchinae because of the presence of a mandibular scar. The scar in *Dirotognathus*, though

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minute, usually can be detected on at least one mandible, but occasionally it seems to be entirely effaced. Although the two genera probably should be maintained as distinct, there is little doubt that a perfectly natural classification would show them to be closely allied.

In the following key the term "spur" or "tibial spur" is applied to the short, porrect spine, straight or often slightly curved, rising from the lower apical angle of the tibiae near the base of the mucro (or at the normal position of the mucro on the hind tibia of the ♀, where the mucro is obsolete). When present, the spurs are two in number on hind tibia, one on the middle tibia, and one or none on the front tibia. They are sometimes difficult to differentiate from the paler and narrower spinules that fringe the articular surface.

Key to Species of Lepidophorus

1. Tibiae without spurs; rostrum with one, usually distinct, median carina (sometimes obscured by scales in *rainieri*). 2

At least middle and hind tibiae with spurs; rostrum carinate or not, but never with distinct median carina unaccompanied by lateral carinae 3

2. Length, 6–7 mm. (largest species); elytral scales slender, not entirely concealing derm, often forming brownish and whitish mottlings on disk; fifth sternite of ♀ at most shallowly impressed. Alaska (type locality, Sitka). *inquinatus* Mann.

Length, 3.75–4.5 mm. (5 mm., teste Van Dyke); scales above dense, concealing the derm, fuscous on elytra except for some vague, paler blotches on sides and declivity; fifth sternite of ♀ with a deep, rounded impression. Mt. Rainier, Washington (type locality) .... *rainieri* Van Dyke

3. Anterior tibia without spur; pronotal setae rising from the general system of punctures; elytral scales small and individually distinct; antennal scape setose only, first funicular segment equal to, or longer than, second and third together, club at least twice as long as wide; eye rather large and convex; abdominal scales plumose 4

All tibiae with spurs; pronotal setae, in whole or part, rising from smaller punctures on the intervals between the larger punctures; elytral scales sometimes agglutinated; antennal scape usually setose and squamose; eye smaller, feebly convex; abdominal scales mostly simple (largely seta-like in *setiger*) 5

4. Derm above shining black or piceous; scales above more or less variegated (brownish aeneous to opalescent) and forming pale, sometimes rather vague, lateral stripes on pronotum and a spot on humerus; fringe of scales on fore margin of prothorax not extending across dorsum; ventral edge of ♂ hind tibia angulate or toothed at basal three-sevenths. Idaho and Washington.
angulatus n. sp.

Derm reddish to rufopiceous, the prothorax darker; general color of vestiture brownish, without pale pronotal stripes; pronotal fringe of scales complete; ♂ hind tibia sinuate but not angulate on ventral edge. Colorado.
plumosus n. sp.

5. Even elytral intervals not more prominent than the odd; elytral setae on disk evenly distributed, or sometimes a little more numerous on third and fifth intervals (absent on apical halves of second and fourth in *setiger*) 6

Elytral intervals 2, 4, and 6 more prominent and, on disk, with more setae than the odd intervals; on declivity, the second, and sometimes the fourth also, nearly destitute of setae; pronotal punctures cribrate 9

6. Second and fourth intervals with setae their entire length or rarely nearly lacking them on the declivity; abdominal vestiture largely squamose and usually covering the derm; western and northwestern North America 7

Second interval without setae except at basal third and near apex; fourth interval without setae except in basal half and near apex, rarely with a few between; abdominal vestiture largely hair or seta like and leaving most of derm exposed; eastern part of the United States 10

7. Length, 3.7–5.25 mm., usually at least 4 mm.; feeble ocular lobe usually present; elytral scales individually distinct; elytral setae fine and inconspicuous against the gray or vaguely mottled background; vestiture of antennal scape not forming a scaly crust. Yukon Territory, Canada; Alaska (type locality, "Lat. 65°") ... *lineaticollis* Kirby

Length usually less than 4 mm.; ocular lobe faint or wanting; elytral scales, and sometimes the pronotal also, more or less completely agglutinated; elytral setae stouter and conspicuous against the darker background; antennal scape usually with a scaly crust; south of Alaska 8

8. Length, 3 mm.; dorsal coating dense, the pronotal punctures

completely covered by an even crust; no rostral carinae visible through the dense scales; fifth sternite of ♀ not impressed; British Columbia .... **pumilus** n. sp.

Length, 3.1–4 mm., most specimens at least 3.3 mm.; dorsal coating less dense, the imprints of the pronotal punctures visible beneath the scales; rostral carinae usually visible; fifth sternite of ♀ transversely impressed . . . **bakeri** n. sp.

a. Elytral intervals subplanate to feebly convex. Washington .... *bakeri* typical

b. Elytral intervals more strongly convex. Utah. **bakeri utensis** n. subsp.

9. Length, 4–5 mm.; rostral carinae subequally developed, often faint, rarely the lateral ones evidently more prominent; prothorax, at least of ♂♂, relatively longer than in the preceding species; groove around upper eye margin finer and shallower than in *setiger*. Washington and Oregon (type locality, Forks, Clallam Co., Washington). *alternatus* Van Dyke

10. Length, 3.25–4.25 mm.; rostral carinae variable, but frequently the lateral are stronger; prothorax of ♂♂ relatively as long as, or a little longer than, in *alternatus*; a rather deep groove present around upper half of eye margin. New York; Pennsylvania; Maryland; Virginia; West Virginia (type localities, St. Vincent, Pennsylvania; Virginia) .... *setiger* Hamilton

Lepidophorus angulatus n. sp.

Length, 3.8–4.8 mm.; width, 1.9–2.5 mm. Derm black, antennae and legs rufous, the femora often infuscate basally, above not entirely covered by small, subcontiguous but not overlapping scales of variegated hues, the darker ones brownish to cupreous and predominating on disk, the paler or whitish ones often faintly tinged with blue or green and more abundant on humerus, declivity, and sides of elytra and forming a lateral stripe on pronotum; many of the scales with a varnish-like sheen.

Rostrum faintly arcuate, lightly deflexed at apical third, slightly less than half as thick as long, a little shorter than prothorax, above in profile subcontinuous with front in most specimens, basal two-thirds not densely clothed with slender scales and with a few, fine, suberect setae; surface closely punctate and more or less rugose longitudinally, faint lateral carinae sometimes visible, deflexed apical third thinly setose and more finely punctate; interantennal fovea small and punctiform to larger and elliptic, the surface in front of it often briefly carinate. Eyes separated above by a little less than basal width of beak. Head with dense, slender scales, and usually with a small interocular puncture. Prothorax about one-fifth wider than long, widest at or slightly before middle, base wider than apex (about 5 to 4), sides rather strongly rounded, not constricted apically; pronotum evenly convex, closely punctate, with or without trace of a smooth median line, the pale scales forming the lateral stripes broader and more densely placed than those on disk and, at least in basal half, nearly concealing the derm, scales on disk often coppery, and sometimes quite narrow and sparse, setae slender and subprostrate. Elytra rather strongly convex, declivous toward base on disk, much wider than prothorax, ovoid, the sides feebly rounded and slightly converging posteriorly from behind the obliquely rounded humeri, intervals flat or nearly so, the sutural often feebly elevated on declivity, the scales ovate to rounded, small (3 to 5 in width of an interval); setae fine, inconspicuous, arranged in a somewhat irregular row on each interval, sometimes more numerous on third and fifth; serial punctures closely set, the striae not or feebly impressed.. Beneath, including flanks of prothorax, rather densely clothed with dirty white plumose scales; abdominal setae hair-like. Femora sparsely scaly and setose, tibiae setose only and finely denticulate on ventral margin, more strongly so on front pair, the hind pair, ♂, with a broad emargination on inner edge that reaches from lower apical angle to an angulation or tooth at basal three-sevenths. Apex of fifth sternite, ♂, with a short, broad, and feeble, longitudinal impression (little more than a flattening), the surface each side set with fine, suberect pile; a similar, but feebler, modification in female.

Type locality.—Moscow, Idaho, J. M. Aldrich, collector; 2 males and 1 female.

Other locality.—Pullman, Washington, J. F. Clarke, collector, 2–VI–33, Truck Crop No. 4962, 4 females; same locality, O. Edwards, collector, V–3–33, Truck Crop No. 4962, 1 female.

Type.—♂, Cat. No. 50652, U. S. N. M.

In several of the Washington specimens, the prothoracic fringe of minute scales is wanting from abrasion. The plumose scales are minutely fringed at margins, not deeply split into filaments. The metepisternal suture, though obscured by vestiture, usually can be traced from its apex backward to near the hind coxa.

Lepidophorus plumosus n. sp.

Length, 4.7–5.2 mm.; width, 2.1–2.4 mm. Slightly more slender than usual in the genus, ♀ somewhat stouter in form than ♂; derm dull reddish to piceous, prothorax usually darker; above clothed with small, ovate or oblong, brownish scales and slender setae, with an admixture of some paler scales, the latter usually more numerous toward sides and on declivity of elytra.

Rostrum stout, very feebly arcuate, four-fifths to five-sixths as long as prothorax, not continuous with front in profile, above densely punctate and more or less rugose longitudinally, carinae absent or mere traces of them visible through the usually thin coating of setae and slender scales, apical deflexed area more sparsely setose and less coarsely sculptured, interantennal fovea, when present, sublinear. Eyes as in *angulatus,* convex and separated above by slightly less than basal width of beak; no distinct interocular puncture. Prothorax slightly wider than long, widest before middle, sides rather strongly rounded, not constricted apically; pronotum evenly convex, densely punctate, and with or without trace of a short, smooth, median line, scales on disk slender, the setae, though fine and subprostrate, quite long and conspicuous, the scales toward sides broader and sometimes paler, but not forming evident vittae. Elytra ovoid, disk less convex than in *angulatus,* striae feebly impressed, the punctures closely set, the surface scales small, subcontiguous but not completely covering derm, intervals nearly flat, setae fine, arranged in an irregular single row on even intervals, more numerous and more irregular on odd intervals. Beneath sparsely clothed with inclined hairs, and more densely so with small, plumose scales, the scales on flanks of prothorax narrower, darker in color, and more feebly plumose (some of them apparently simple) than in *angulatus.* Legs clothed about as in *angulatus,* the femoral scales more slender; tibial denticulations somewhat feebler than in *angulatus.* Fifth sternite, ♂ and ♀, slightly flattened apically, the surface each side set with fine, suberect hairs, more evident in ♂.

Type locality.—Garland, Colorado, Hubbard and Schwarz collection; 5 specimens.

Other locality.—Veta Pass, Colorado, Hubbard and Schwarz and C. V. Riley collections; 3 specimens. "Col.," 2 specimens from Chittenden collection.

Type.—♂, Cat. No. 50654, U. S. N. M.

Though structurally similar to *angulatus,* this species has a quite different habitus due to its more slender form, and darker, more nearly uniform color of scales, lack of pronotal vittae, and the longer, finer and more conspicuous elytral setae. In *angulatus* the sutural interval on the declivity is often slightly but distinctly elevated, not perceptibly so here. The metepisternal suture is a rather coarse groove extending from its apex backward three-fourths to five-sixths the distance to the hind coxa. Because of the sparser scales, the suture is usually more distinct than in *angulatus.* A single female from New Mexico with still longer elytral setae is probably subspecifically distinct.

Lepidophorus pumilus n. sp.

Length, 3 mm.; width, 1.58 mm. Derm above covered by a crust of dirty brown, agglutinated scales, unrelieved by discal markings. Scales on head and rostrum slightly, those beneath distinctly, paler. Pronotum feebly and evenly convex, the outlines of the underlying punctures not visible. Elytral setae yellowish or golden, short but conspicuous against the dark background, and forming a single regular row on each interval.

Rostrum stout, very feebly arcuate, a little shorter than prothorax, upper surface densely scaly in basal three-fourths and with relatively coarse, suberect setae which form two irregular longitudinal rows each side of middle, the setae more crowded above eye; apical fourth roughly punctate, sparsely setose. Anteriorly, the upper edges of the scrobes are carina-like and slightly but distinctly elevated above the upper rostral surface, the edges of scrobes, as seen from above, rather abruptly bent outward above the antennal socket, then subparallel the short distance to apex; scape scaly and setose, first funicular segment a little shorter than the second plus third, fourth to seventh transverse, the seventh strongly so. Head without setae, the scales small, dense, striated; interocular puncture not visible. Eyes small, feebly convex, separated above by about three-fourths basal width of rostrum. Prothorax about as long as wide or distinctly wider than long, sides rather strongly and evenly rounded, widest point median or slightly antemedian, pronotum with relatively long, backwardly directed, subrecumbent, brownish-yellow setae. Elytra considerably broader than prothorax, intervals flat, the striae narrow and finely and indistinctly punctate. Beneath sparsely setose and densely scaly; fifth sternite of female somewhat flattened, but not impressed, apically. (♂ unknown.)

Type locality.—Nicola, British Columbia, Canada, 3,800 feet, 21–IX–1932, G. J. Spencer, on *Achillea lanulosa,* 1 specimen.

Other locality.—Midday Valley, Merritt, British Columbia, Canada, V–28–1925, J. Stanley, on *Pinus ponderosa,* 2 specimens.

Type.—♀, Cat. No. 50655, U. S. N. M.

In the type specimen the prothorax is relatively longer than in the paratypes. The small size, relatively coarse rostral setae, completely obscured pronotal punctures, fine strial punctures, and nonimpressed fifth sternite of the ♀ seem characteristic.

Lepidophorus bakeri n. sp.

Length, 3.1–3.9 mm.; width, 1.5–2.1 mm. Derm rufopiceous to black, densely clothed with striated scales, the scales above dull aeneous-brown to fuscous, clean specimens with pale lateral and median pronotal stripes (the stripes often interrupted), and irregular pale mottlings on elytra, the pale areas of variable extent and rarely expanded over most of elytra, the pale scales above and below sometimes with more or less distinct opalescent tinge. Elytral setae distinct, forming a single row on each interval.

Rostrum nearly straight basally, deflected downward apically, half as thick as long, somewhat shorter than prothorax, upper surface subplanate, virtually continuous with front in profile, apical fourth setose, rest of surface densely clothed with broad scales and backwardly inclined setae, the scales brownish to cinereous, the setae usually more numerous above eye; middle half of length with a lateral, and often a median, carina showing through the vestiture, the median carina forked anteriorly to enclose the triangular to fusiform interantennal fossa; apical region rugosely punctate. Scape reaching a little past hind margin of eye at middle, first funicular segment about equal to second plus third, the fifth and sixth, and sometimes the fourth, submoniliform, the seventh broader and strongly transverse, club somewhat less than twice as long as wide. Eyes small, very feebly convex, separated above by about two-thirds basal width of beak. Scales on head narrower than on rostrum, more closely appressed and frequently with a pale greenish, varnish-like sheen; setae wanting; interocular puncture not visible. Prothorax somewhat wider than long as a rule, but virtually as long as wide in some ♂♂, widest at or in front of middle, sides rather strongly rounded, not or faintly constricted toward apex; pronotum moderately convex, densely punctate, densely clothed with appressed scales and subprostrate setae, the latter posteriorly directed in general but, on anterior margin, transversely directed and more nearly erect, absent along a narrow median line, the pale scales on the lateral stripes, and to some extent on the median stripe also, flat, covering surface, and individually distinct, those on rest of disk darker, more or less agglutinated, and so closely appressed to the surface contours that the puncture pits are plainly visible. Elytra about one-half wider than prothorax, humeri rounded, sides nearly straight and slightly converging backward, strial punctures distinct, intervals nearly flat to feebly convex, often more convex basally, apically and laterally, each with a regular row of setae, those on dorsum strongly inclined, those on declivity more nearly erect, the setae on second interval on declivity sometimes sparser, those toward base of third and fifth sometimes more abundant; scaly covering more or less agglutinated though, on clean specimens, some of the scales are individually distinct. Beneath and legs setose and densely scaly, the vestiture finer and sparser on fifth sternite, derm of abdomen and legs often reddish; abdomen, ♂, broadly and feebly impressed basally, fifth sternite, ♀, with a broad, shiny, sparsely punctate, transverse impression on apical two-thirds, the impression usually distinct but occasionally rather feeble.

Type locality.—Cle Elum, Washington. Truck Crop No. 4972.
Other locality.—Easton, Washington. Truck Crop No. 4865.
Type.—♂, Cat. No. 50656, U. S. N. M.

Described from 127 specimens collected by Mr. W. W. Baker and Mr. Joseph Wilcox in April and May.

At first sight the pronotum appears to be almost devoid of scales except on the median and lateral vittae, but in reality the entire surface is covered by scales which adhere so closely to the surface contours that the puncture depressions and the intervals between them are clearly visible. The seta-bearing punctures usually are distinctly smaller than the scale-bearing punctures, though occasionally the two types appear to coalesce, the setae then rising from one side of a large puncture. The metepisternal suture usually is distinct for about half its length, or less, anteriorly.

Lepidophorus bakeri utensis n. subsp.

Length, 3.6–4.2 mm.; width, 1.7–2.1 mm. The description of *bakeri* applies to this form except for the following average differences: In *utensis* the size is slightly larger and the form a little more slender, the elytral striae deeper and the intervals slightly to rather strongly convex. In several specimens the lateral carinae of the rostrum are strongly elevated while the median carina is scarcely discernible, the surface between the lateral carinae thus appearing concave.

Type locality.—Alta, Utah, 6–28, Hubbard and Schwarz collection; 9 specimens, ♂ and ♀.

Type.—♀, Cat. No. 50657, U. S. N. M.

The status of several Park City, Utah, specimens, which are smaller than *utensis,* is uncertain; they may represent another feebly differentiated local form of *bakeri.*

A NEW COLEOCENTRUS FROM VERMONT (ICHNEUMONIDAE, HYMENOPTERA)

By Harry D. Pratt, Massachusetts State College,
Amherst, Mass.

A series of five females of apparently a new species of Coleocentrus were taken by the writer at Laurel Lake, Jacksonville, Vermont, from June 23 to July 23, 1935, the type being taken July 20 at an altitude of 1700 feet. They were taken either while flying low over the ground about spruce and balsam stumps, or while sunning themselves on the young balsam firs (Abies).

Coleocentrus rufocoxatus n. sp.

Female.—Length 15 mm.; antennae 11 mm.; ovipositor 8 mm.

Structurally much like *C. pettiti* Cresson but differing in having all coxae, tegulae, palpi, and first three antennal segments beneath, reddish. A series of five females average 2–3 mm. shorter than a similar series of five *C. pettiti* taken at the same time in the same locality. The ovipositor is only half the length of the body as compared with three-fourths the length of the body in Cresson's species.

Agrees structurally with Cushman's description of *C. pettiti*[1] as follows: "head polished; face finely punctured, temples convex, rather broad . . . petiolar area of propodeum not especially short, longitudinal carinae strong, spiracle long, oval; abdomen more polished, first tergite less than half the second; hypopygidium much less than half as long as abdomen." It differs in having the ocellocular line a little more than twice the diameter of the lateral ocellus, and in having the ovipositor but half as long as the body.

Head, thorax, and abdomen, black; with the following parts rufous: palpi entirely, tegulae, and all the legs, except a brown line externally on the posterior tibiae, ventral side of the scape, and pedicel, and base of third antennal segment. Wings distinctly suffused with yellow; stigma, except at base, and veins black but distinctly honey-yellow at base; areolet petiolate, with the petiole not half the length of the free part of intercubitus.

Type ♀ in the collection of author, Massachusetts State College, Amherst, Mass. Paratopotypes, 4 ♀♀.

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[1] Proc. U. S. Nat. Mus., Vol. 57, 1920, page 511.

THE MAXIMUM NUMBER OF ANTENNAL SEGMENTS IN THE ORDER DIPTERA, WITH THE DESCRIPTION OF A NEW GENUS OF CECIDOMYIIDAE

By Charles P. Alexander, Amherst, Mass.

For many years the maximum number of antennal segments in any known species of Dipterous insect was 39, reported many years ago by Osten Sacken in the Tipulid *Gynoplistia* (*Cerozodia*) *plumosa* (Osten Sacken) of New Zealand. In recent years, this figure was found to be equalled and exceeded by two species of Cecidomyiidae, *Lasioptera howardi* Felt, with 39, and *Ficiomyia perarticulata* Felt, with 41. During the past Spring, my good friend, Dr. Fred W. Edwards, in a letter written concerning his recent trip to Ruwenzori and other high mountains in Central Africa, mentioned among other notable discoveries that a Bruchomyiine Psychodid had been found that, with a hand-lens, appeared to have at least 60 antennal segments. I have now to report the discovery of a Cecidomyiid from Panama that has no fewer than 65 such segments, and which would seem to represent the maximum number as yet discovered within the limits of the order.

The various groups that have multi-articulate antennae are listed herewith, together with the maximum figure reported to this date.

Psychodidae	30	Thaumaleidae	12
(60, Edwards, ante)		Chironomidae	15
Tanyderidae	25	Culicidae	15
Ptychopteridae	20	Cecidomyiidae	65
Tipulidae	39	Mycetophilidae	17
Anisopodidae	16	Bibionidae	17
Blepharoceridae	15	Scatopsidae	12
Simuliidae	10	Rachiceridae	38

Feltomyia, gen. n.

Palpi reduced, apparently 2-segmented. Antennae 65-segmented; scape relatively large, pedicel more reduced; flagellum consisting of 63 approximately similar segments, of which the terminal one is about equal in length to the combined penultimate and ante-penultimate segments and is apparently the result of the fusion of two elements; all flagellar segments of approximately the same shape, being globular with stout, glabrous, apical pedicels; the outer segments become more depressed to appear more or less disk-like, this flattening being accompanied by a narrowing and shortening of the pedicel. Flagellar segments with a subbasal ring of from 10 to 12 long powerful verticils that considerably exceed the segments in length; remainder of surface of body of segment covered with small simple setae; a low, generalized type of circumfilum at apex of body of each segment, just where it breaks into the pedicel, such circumfila most clearly apparent on the basal and intermediate segments.

Legs long and slender; tarsi 5-segmented, the basitarsus very short. Wings with the surface covered with abundant scattered macrotrichia. Venation: *Sc* present, the distal end becoming obsolete beyond the origin of *Rs; Rs* short; *M* and *r–m* forming a composite, gently arcuated vein between arculus and end of *Rs,* about as in the genus *Johnsonomyia;* vein R_{1+2} (1st longitudinal) reaching *C* at near two-fifths the length of wing; vein R_5 (3rd longitudinal) powerful, reaching the margin caudad of wing-apex; vein *Cu* (5th longitudinal) simple but with vague indications of an anterior branch or fold. Ovipositor moderately long and slender, the involved segments cylindrical, their combined length subequal to one-third or one-fourth the remainder of abdomen.

Genotype.—**Feltomyia polymera,** sp. n. (Neotropical Region: Panamá).

I take unusual pleasure in naming this new generic group in honor of our distinguished specialist on the Cecidomyiidae of the World, Dr. Ephraim P. Felt. I am referring the group to the tribe Porricondylaria in the typical subfamily, based upon the combination of presence of circumfila on the flagellar segments; five tarsal segments, with the basitarsus short; and with *Rs* (the so-called crossvein) present. However, the general appearance of the wing of this fly is much as in *Johnsonomyia* Felt, which Felt has transferred to the Heteropezinae. Except for the presence of reduced circumfila, the present fly would appear to fall more truly in the Heteropezinae. It appears to the present writer that the limits of the various subfamilies and tribes within the Cecidomyiidae are far too plastic and that many of the generic groups may well be found to belong elsewhere. An inordinate value has been placed on the number of segments of the maxillary palpus. In the not distantly related family Tipulidae, Edwards and I have shown that the number of such segments is not even of subgeneric value in certain genera (as *Limonia, Hexatoma* and others) where, in closely allied species, the number of palpal segments may be one, two, three or four. From all known genera in the family, the new genus is most readily separated by the number of antennal segments.

It may further be noted that the so-called "crossvein" found in the more generalized subfamilies and tribes of the Cecidomyiidae (Lestremiinae, Heteropezinae, Porricondylaria) is not a crossvein at all but is the Radial Sector, *Rs* (as is well shown in Felt, N. Y. St. Mus. Bull. 257, pl. 1, figs. 1–9; 1925). In accordance with the interpretation of the radial field as given in recent papers by the present writer, the remainder of the so-called "third vein" is vein R_5 alone, since all evidence shows that the elements of the radial field lying between R_{1+2} (1st vein) and R_5 (3rd vein) have been lost by atrophy of veins rather than by fusion. The longitudinal element connecting *Rs* with the wing-base is in reality a composite vein, including the basal section of vein *M* and the longitudinal or oblique *r–m* crossvein. In certain primitive types, as *Catocha, r–m* is short, transverse in position, and joins *M* at a strong angle, but in the more specialized genera, it is directed basad and assumes an oblique or longitudinal position. Exactly homologous conditions are to be found in the closely allied families Sciaridae and Mycetophilidae. The distal section of vein *M* is preserved in certain Lestremiinae and Campylomyzaria.

Feltomyia polymera, sp. n.

Female.—Length, about 6 mm.; wing, 4.5 mm.

Palpi pale. Antennae with scape black; pedicel brown; flagellum white throughout. Head brownish black.

Thorax uniformly brownish black. Halteres dark throughout. Legs with the fore coxae and trochanters black; fore femora black; tibiae darkened subbasally and subapically, the intermediate portion, involving about one-half the segment, dirty white; extreme tip of fore tibia and all of basitarsus snowy white; remainder of fore tarsi snowy white, excepting the darkened base of segment two; middle femora chiefly snowy-white, the dorsal surface on distal two-thirds more darkened; mid-tibia about as on the fore legs but the whitish intermediate portion a little clearer; mid-tarsi as on fore legs; posterior femora snowy-white; posterior tibia with extreme base and tip snowy white, the broad intermediate portion brownish black; all of posterior tarsi snowy white. Wings uniformly grayish, the veins darker, R_5 being especially strong and conspicuous.

Abdomen dark brown, the pleural region even darker.

Habitat.—Panamá (Chiriquí).

Holotype, ♀, Potrerillos, altitude about 3,000 feet, May 6, 1935 (*J. W. MacSwain*). Type preserved in author's collection.

A FUNGUS INFESTING ONION THRIPS.*

By A. I. Bourne and F. R. Shaw, Amherst, Mass.

The subject of insect control by fungous diseases is a question that is, as a rule, somewhat unsafe to generalize upon. A great deal of time and money has been spent on cultural and distributional methods of fungi, which in many cases have failed to give the control that was hoped for.

It is true that there have been more failures than successes where fungi have been used as a means of insect control. Possibly the methods used are not suited for the particular fungus and insect involved or possibly the outbreak of disease is entirely dependent upon environmental factors, which could not be altered practically.

It should be indicated, however, that some workers have been able to utilize fungi as a means of control for insects. Dustan, 1925, reported that by means of artificial inoculation in the laboratory he was able to produce an epidemic of *Entomophthora sphaerosperma* attacking *Psylla mali* about two weeks earlier than it would naturally occur.

In 1932 in the Connecticut Valley section of the onion growing district in Massachusetts, it was noticed that many thrips were affected by some sort of a disease which was killing great numbers of them. The thrips were at first sluggish in their movements and later turned black in color. This was very generally noted in onion fields throughout the Valley.

Upon microscopical examination it was found that the bodies of the thrips, which were sluggish, were almost completely filled with fungus mycelium (fig. 1). This, in turn, formed resting spores which were quite large and black (fig. 2). These spores completely filled the body of the dead thrips (fig. 3). The dead thrips (fig. 4a) adhered to the onion leaf until their body covering was broken, thus exposing the spores (fig. 4b). The fungus was identified tentatively as *Empusa sphaerosperman.* It is not known how infection occurs in nature. Thus far, no conidia have been observed to be produced, either by germinating the spores in water, or water and sugar solutions, or by placing the thrips in a moist chamber.

It is believed that a successful culture of the spores was made by

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* Contribution from Mass. Agric. Exper. Sta.

Dr. Theodore Ayers at the Massachusetts Experiment Station. At present, however, this has not been positively determined.

The fungus during the season of 1932, as noted previously, was generally abundant and well distributed. In 1933, while the distribution was about the same, the fungus did not occur in any such abundance as was noted in 1932.

During the season of 1934 the fungus appeared in intensity equal to that of the 1932 season. Many plants had as many as fifteen to twenty dead thrips.

The present season failed to show any appreciable amount of the fungus present. It was recorded as being present in one field on August 15.

While it is not likely that this fungus alone would ever solve the question of thrips control, it is a factor which should be investigated before being dismissed as worthless, particularly in fields of moderate infestation and in favorable seasons.

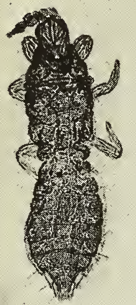

Fig. 1

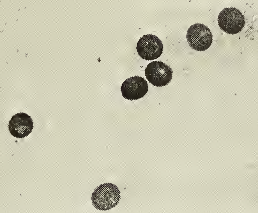

Fig. 2

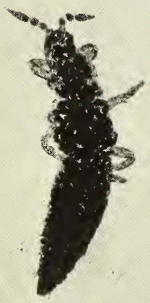

Fig. 3

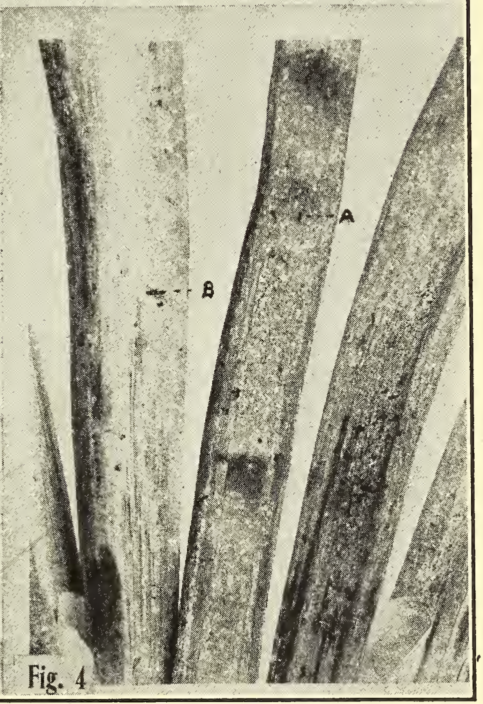

Fig. 4

FOUR NEW ARIZONA LEAFHOPPERS.*

By E. D. Ball, University, Tucson, Arizona.

Osbornellus ignavus Ball n. sp.

Resembling *auronitens* Prov. in size and form but lacking the markings. Pale cinnamon with a broad ivory commissural stripe interrupted by two pairs of black spots. Length, ♀, 5 mm.

Vertex slightly narrower and more pointed than in *auronitens,* the face similar to that species. Venation similar to *auronitens,* the claval veins variable but usually more definitely angled posteriorly, occasionally approaching the commissure at nearly a right angle. The outer anteapical cell long and narrow and nearly parallel margined, with the nerve at the base of the fifth apical arising from it, as in *jucundus* Uhl. instead of from the subcosta beyond the junction as in *auronitens.* The three reflexed nervures neither enlarged or dark marked. Male plates together slightly long-triangular with narrow filamentous tips not as long as the plates.

Color pale cinnamon above and below, the pronotum a little darker the eyes black. A broad ivory stripe along the scutellar and commissural margins of clavus, twice interrupted with black dots on the apices of the claval nervures.

Holotype ♀, allotype ♂, and eight paratypes Aug. 23, 1931, and four paratypes July 26, 1935. All taken on the Chihuahua pine in the Chiricahua Mts., Ariz., by the writer. Paratypes in the National Museum and Kansas University collections. The big white saddle and the lack of dark on the reflexed nervures will at once separate this from all other species.

Twiningia solitaria Ball n. sp.

Resembling *malvastra* Ball with a longer vertex and more heavily irrorate elytra. Length ♀ 5.5 mm.

Vertex broader than in *blanda* Ball and slightly less acute, the submarginal black line more definite and farther from the white edge. Venation as in *malvastra* with about 14 black-tipped, reflexed veinlets to the costa. Female segment with the outer angles excavated, the median third roundingly pro-

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* Types in the author's collection unless otherwise specified.

duced and then cut out in a parallel margined incision half way to the base of the segment. Male genitalia similar to *blanda* the angles of pygofers armed with short curved spines.

Color creamy above and below; the pronotum slightly darker; vertex margin black lined above and below, the line on the vertex broad, interrupted at apex and faintly margining the median suture. Elytra golden subhyaline the nervures concolorous. Ivory or milky spots in the areoles, the cells throughout the median portion of the elytra rather heavily irrorate with fine black dots. The apical cells slightly smoky with a darker cloud behind the round ivory spots.

Holotype ♀, allotype ♂, and eight paratypes beaten by the writer from the Joshua Trees (*Yucca brevifolia*) north of Littlefield, Arizona, June 27, 1935, and four paratypes taken from the same plant by Dr. R. H. Beamer, August, 1935, in the Kansas University collection.

Texanus sonorus Ball n. sp.

Resembling *decorus* O. and B. but much lighter with a broader vertex and a much broader front. Ashy gray with ivory on vertex and commissure, bordered by dark. Length ♀ 6 mm.; width 3 mm.

Vertex about one-third wider than in *decorus* roundingly right angled, the margin rounding over either side of the slightly conical apex. Front much wider and proportionally shorter than in *decorus*. Venation similar, the vermiculations much finer and inclined to be aggregated against the ivory areas. Female segment about twice as long as in *decorus* the lateral angles rounded. The posterior margin deeply angularly excavated with a broad quadrangular notch that extends almost to base. The notch in *decorus* is less than half as long. Male valve one-third the size of that in *decorus*. The plates broader and shorter, together semicircular with a slight median notch posteriorly while in *decorus* they are angular.

Color pale ashy gray with the vertex tipped with ivory and a broad scutellar and commissural ivory stripe, the dark reticulations massed against the ivory.

Holotype ♀ and allotype ♂ taken by the writer from white sage (*Artemisia mexicana*) on the slopes of Atascasa Mt. near the Mexican border in Arizona, August 15, 1935.

Amplicephalus atascasus Ball n. sp.

Smaller and with a narrower and more sharply angled vertex than in *lassus* Ball. Dirty straw with a pair of spots on vertex and another pair on scutellum. Nervures light. Length ♀ 3 mm.

Vertex slightly longer than its basal width conically rounding over to face with a right angled apex. The face as in *lassus,* the anterior femora flattened as in that species and in addition triple banded as in *osborni* Van D. Elytra covering abdomen, relatively broad, two cross nervures and a divided central anteapical, usually additional reticulation on clavus and costa and about three spurs along the cubitus between the cross nervures. Female segment rather short, slightly angularly excavated with the median fourth quadrangularly produced and roundingly excavated posteriorly. Male valve enormously enlarged, the posterior margin broadly rounded, plates together not as wide as the valve, rapidly narrowing to acute apices which are not as long as the valve. The valve and plates uplifted to expose an almost circular loop of the aedeagus.

Color creamy straw washed with rusty, a pair of crescents on the disc of vertex and often six small dashes on the anterior submargin, scutellum with the subasal triangles and a pair of small dots on the disc dark. Elytra with smoky bands on the outer part of clavus and central part of corium. The nervures and sutures broadly ivory white in sharp contrast. The face dark with light arcs and margins. The anterior margin of vertex ivory and extending down in a point onto the face.

Holotype ♀, allotype ♂, and 6 paratypes August 16, 1935. All swept from the steep grass slopes of Atascasa Mt. east of Ruby, Arizona, by the writer. The long head and the spurs on the cubitus will at once separate this species.

A NEW MEMBRACID FROM ILLINOIS.

W. D. Funkhouser, University of Kentucky, Lexington, Ky.

The writer has received from time to time during the past few years a *Stictolobus* from Illinois which he has tentatively, but with considerable doubt, determined as *S. trilineatus* Funkh.

Recently a fine series of this insect has been received from Dr. Herbert H. Ross, of the State Natural History Survey of Illinois, which contains enough material to show definitely that the Illinois species is new.

It is therefore described as follows:

Stictolobus lateralis sp. nov.

Large, dark green, with yellow lateral stripes; coarsely punctate; not pubescent; pronotum convex; posterior process reaching apex of abdomen; tegmina entirely exposed; undersurface yellowish; femora dark brown.

Technical description:

Head wider than high; greenish-yellow with median green stripe; feebly longitudinally striate; not punctate; base strongly arcuate with tuberosities above the eyes; eyes mottled black and yellow; ocelli large, amber-colored, much nearer to each other than to the eyes and situated well below a line drawn through centers of eyes; inferior margins of genae sinuate; clypeus subquadrate, extending for half its length below inferior margins of genae, tip rounded and densely pilose.

Pronotum dark green mottled with yellow; coarsely punctate; not pubescent; a greenish yellow stripe arising above each eye, extending over humeral angle and following lateral margin almost to tip of posterior process; a yellow median stripe extending from head to base of posterior process; median carina percurrent; metopidium convex, higher than wide; smooth fossae on each side above eyes; humeral angles strong, triangular, blunt; posterior process impinging on tegmina, tectiform, apex sharp, tip black, extending to a point about half-way between internal angles and tips of tegmina and just reaching tip of abdomen.

Tegmina hyaline, entirely exposed; base narrowly greenish, coriaceous and punctate; veins strong and brown; limbus wide and clouded; costal margin bright yellow; five apical and two discoidal areas.

Undersurface of body greenish yellow; femora dark brown; tibiae greenish; tarsi ferruginous.

Length from front of head to tips of tegmina 8 mm.; width between humeral angles 3 mm.

Type: Female. Male similar.

Locality: Horseshoe Lake, Illinois.

Most the specimens seen are from the type locality and were collected on cypress by DeLong and Ross, July 11, 1935.

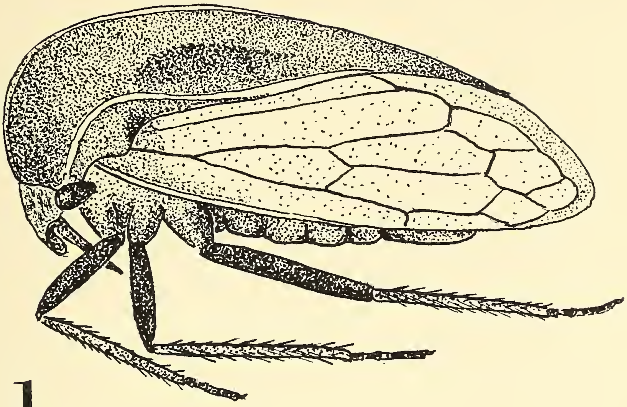
Holotype and three paratypes in author's collection; allotype and sixteen paratypes in collection of the Illinois State Natural History Survey.

PLATE II.

FIGURES.

Stictolobus lateralis sp. nov.

1. Lateral view.
2. Frontal view.
3. Dorsal view.



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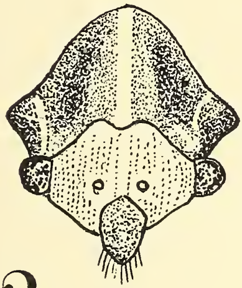

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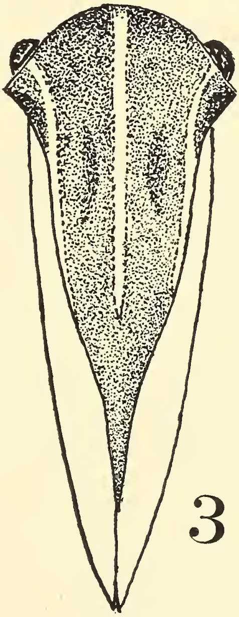

3

A NEW SPECIES OF PERLODES FROM THE WHITE MOUNTAINS, NEW HAMPSHIRE (FAMILY PERLIDAE; ORDER PLECOPTERA).

By Charles P. Alexander, Amherst, Massachusetts.

On July 3rd, 1933, while engaged in collecting alpine insects in Tuckerman's Ravine, high up on the southeast side of Mount Washington, New Hampshire, Mrs. Alexander discovered a single male specimen of a large subapterous stone-fly. Since marked brachypterism in the family had been reported only in Western American members of the genus *Perlodes* Banks and in a single species of *Perla* Geoffroy (*languida* Ndm. and Clsn., of Montana and Wyoming), I was particularly interested in the specimen. A careful search failed to reveal more material of this species.

The individual mentioned was found resting on a boulder in the center of a turbulent mountain torrent immediately below the melting edges of the miniature glacier that annually forms in the Ravine. The fauna and flora at that date corresponded nearly to mid-May or even earlier at the foot of the mountain and various parties of athletes were engaged in skiing over the great expanses of snow and ice still persisting in the Ravine.

Very naturally, I at first believed that the specimen represented the still unknown male sex of *Perlodes slossonae* Banks, described from a female taken in this same general area (White Mountains, New Hampshire; Type No. 11,308, Museum Comparative Zoology) but a critical comparison of the material with published descriptions, and especially a survey of the degree of brachypterism found in the American species of *Perlodes* indicates that it is highly improbable that the present male can be definitely associated with the female of *slossonae*.

A tabulation of various measurements, especially of total wing-expanse and length of the fore wing, where this is known, of various North American species of *Perlodes* is here provided.

Species	Wing-expanse ♂	Wing-expanse ♀	Length, fore-wing
americana Klap.	24 mm.	34–37 mm.	
bradleyi Smith	32 mm.*	37 mm.	♂, 15 mm.
dolobrata Smith	33 mm.	44 mm.*	♀, 21 mm.
ignota Smith	......	29 mm.	

Species	Wing-expanse ♂	Wing-expanse ♀	Length, fore-wing
irregularis Banks	32 mm.	48 mm.	
lineata Smith		34 mm.	
margarita n. sp.	12 mm.	......	♂, 4.2 mm.
minor Klap.	......	32 mm.	♀, 14 mm.
signata Hagen	18–30 mm.†	42 mm.	♀, 18 mm.
slossonae Banks	......	30 mm.	♀, 13 mm.

* Discrepancy in published data between length of fore-wing and total wing-expanse; width of thorax at point of wing-insertion equals from 4 to 6 mm.

† Minimum figure represents extreme of brachypterism in species.

It will be seen from the above tabulation that brachypterism is a prevalent condition in the genus and is invariably more marked in the male sex. As a rule, the fore wing in the male is from 3 to 6 mm. shorter than in the associated female, reaching an extreme in certain individuals of species such as *irregularis* and *signata*. The chief distinctions between the present fly, *margarita* n. sp. (male) and *slossonae* (female), besides the unusual degree of difference in wing size and conformation, lie in the coloration, especially of the legs, cerci and abdomen, and in the tendencies of wing-venation. Miss Smith's figure of *inornata* (Smith),[1] which is placed as a strict synonym of *slossonae* by Needham and Claassen,[2] shows an unusual scarcity of crossveins in cells M and Cu_1, in fact, almost the extreme as yet found in the American species of the genus (in fore wing, female, only one or two in either of these cells). In *margarita,* this field of the wing is unusually complicated, not merely by numerous crossveins but by supplementary longitudinal elements, that produce a highly complicated network in these two cells; moreover, the crossveins in the outer radial field are fewer in the present fly but this would almost certainly be explainable by the unusual shortness and truncation of this area of the wing.

A second species that must be compared with the present fly is *minor* (Klapalek),[3] still known only from a unique pair taken in "Arctic America" but which, in company with numerous other Arctic American types of insects, may well be found far to the south on the arctic island constituted by the higher portions of Mount Washington. This latter species is quite differently colored and has the male hypopygium of distinct conformation.

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[1] Trans. Amer. Ent. Soc., 43, pl. 34, fig. 62; 1917.

[2] Plecoptera No. Amer. p. 59; 1925.

[3] Coll. Zool. Selys, 4: 22; 1912.

Perlodes margarita n. sp.

Male.—Length (from tip of labrum to end of abdomen, excluding cerci) about 15 mm.; total expanse of wings, about 12 mm. Fore wing, 4.2 x 2.2 mm.; hind wing 4 x 3.6 mm. Cerci about 11 mm.; antenna, about 8 mm.

Antennae dark brown throughout. Head chiefly yellow, the M-shaped darkened area vaguely indicated, more distinct on cephalic portion; median ocellus markedly smaller than the laterals, the latter about as far from one another as the distance of either from eye-margin.

Pronotum wider than long, the anterior angles gently rounded, the posterior angles more obtusely so; general coloration of pronotum obscure yellow, brightest medially, more darkened on posterior border. Legs chiefly obscure yellow, the femora conspicuously striped longitudinally on either side by dark brown; tibiae yellow; tarsi dark brown. Wings dusky, the anal area of hind wing more whitish hyaline. Wings greatly reduced, as shown by the measurements, the fore wing, especially, being very obtuse at apex. Venation distorted, due to reduction in wing size and shape. Crossveins of costal cell of both wings greatly reduced in number, there being only 2 in fore wing, placed immediately before level of cord, these atrophied or nearly so in the hind wing. Sc_2 bending into R exactly at level of cord. Crossveins in outer radial field of fore wing reduced in number to 3 or 4, in hind wing even further reduced. Crossveins in cells M and Cu_1 of fore wing numerous and irregular, cut by secondary longitudinal veinlets to form a network.

Abdominal tergites dark brown, the posterior half of the individual segments slightly paler, the lateral portions with a conspicuous vestiture of rather long yellow setae; sternites more uniformly brownish black. Cerci longer than antennae, the individual segments dark brown outwardly, the narrow basal ring of each paler brown, demarked by narrow yellow transverse lines. Male hypopygium with genital hook of tenth abdominal tergite heavily blackened, especially the cephalic spine; deeply bifid, the outer arm a flattened blade that is slightly dilated outwardly, the apical portion thinner and obliquely truncated; inner arm a glabrous blackened spine, the two arms enclosing a narrow oval notch. Ninth tergite deeply furrowed medially, the adjoining lobes tumid and densely set with setae.

Holotype, alcoholic male, Tuckerman's Ravine, Mount Washington, New Hampshire, at foot of snow field, altitude 4,500 feet, July 3, 1933 (*Mabel M. Alexander*). The wings of right side, together with one antenna and one cercus, have been mounted on a supplementary slide, all preserved in the writer's collection.

I take great pleasure in naming this interesting stone-fly in honor of my wife, Mabel Marguerite Alexander, who collected the type specimen and a host of other new and rare insects in many parts of the United States and Canada.

METHODS AND TECHNIQUE.

Protection Against Anthrenus and Mould.

Under the main head we have published during the past year—and hope to continue to publish—sundry brief notes from the current experience of expert entomologists. From time to time we purpose to reprint helpful suggestions from the writings of a past generation—mostly of those amateurs who so deeply and so well laid the foundations of our science, in those dim days when Ph.D.'s were not even adumbrated. On this occasion, we present sundry helpful ideas from Dr. A. S. Packard's little book, *Entomology for Beginners,* first published in 1888, forty-eight years ago, and still helpful.

The preservation of insect collections from mould and pests has been an ever present problem with entomologists; and many solutions have been offered, ranging from putting China camphor in the boxes to locking the boxes in air-tight steel cabinets. Here are some of the directions presented by various old-time authorities, culled from Dr. Packard's work:

"Laboulbène recommends, for the preservation of insects in a fresh state, plunging them in a preservative fluid consisting of alcohol with an excess of arsenic acid in fragments, or the common white arsenic of commerce. A pint and a half of alcohol will take about 14 grains (troy) of arsenic. The living insect put into this preparation absorbs about 3/1000 of its own weight. When soaked in this liquid and dried, it will be safe from the savages of moths, *Anthrenus* or *Dermestes.* This liquid will not change the colors of blue, green or red beetles if dried after soaking from twelve to twenty-four hours. Hemiptera and Orthoptera can be treated in the same way."

"Another preparation recommended by Laboulbène is alcohol containing a variable quantity of corrosive sublimate, but the latter has to be weighed, as the alcohol evaporates easily, the liquor becoming stronger as it gets older. The strongest solution is one part corrosive sublimate to one hundred of alcohol; the weakest and best is one-tenth of a part of corrosive sublimate to one hundred parts of alcohol. Insects need not remain in this solution more than two hours before drying. Both of these preparations are very poisonous and should be handled with care. The last named solution preserves specimens from mould, which will attack pinned insects during damp summers."

"The nests, cocoons, and chrysalids of insects may be preserved from injury from other insects by being soaked in the arsenated alcohol, or dipped into benzine, or a solution of carbolic acid or creosote."

J. R. T.-B.

BOOK NOTES.

Principles of Insect Morphology, by R. E. Snodgrass; pp. i–ix + 1–666, figs. 1–317. (The McGraw-Hill Co., New York, $6.)

This new work of Dr. Snodgrass's brings together within two covers the enormous mass of material scattered through hundreds —nay, thousands—of publications and of separate articles and distinct works on morphology of insects. Not alone, that; it also brings the modern point of view into interpretation of structures. This reviewer, not being a morphologist, can offer no valid opinion as to such matters; but he can and does appreciate the importance of this work.

Following the Preface, a brief Introduction (Chapter I) reviews summarily the classification of the Arthropoda. Chapter II discusses the general embryological organization and development; the following Chapter III is devoted to a consideration of the body wall and its derivatives, and includes the phenomenon of moulting. The body regions, sclerites and segmentation are treated of in Chapter IV; while V deals with the segmental appendages of arthropods. In the next six chapters, the morphology of the three divisions of the insect body and their appendages is dealt with. Chapters XII, XIII and XIV treat of the organs of ingestion and digestion, distribution, conservation and elimination. Two chapters next following discuss the respiratory and nervous systems; and the succeeding chapter, the sense organs. The final chapters, XVIII and XIX, give the details of the internal and external organs of reproduction. An extensive bibliography of 23 pages closes the formal part of the work. A twenty page index completes it.

One outstanding feature of this book is the glossary of terms pertaining to each chapter at its end. This covers nearly 800 words in their technical meaning.

In connection with this work should be mentioned Dr. Snodgrass's treatment of **"The Abdominal Mechanisms of a Grasshopper"** (Smithsonian Miscellaneous Collections, 1935; vol. 94, no. 6, pp. 1–89). This is a compendious discussion of the musculature, appendages and external genitalia based on *Dissosteira carolina* as compared with other Orthoptera,—Acrididae, Locustidae, Tettigidae, etc. It is designed to follow his preceding paper on *"The Thoracic Mechanisms of a Grasshopper"* (Smithson, Misc. Coll., vol. 82, no. 2 ,1929). This monograph is naturally a more detailed treatment of certain points in the larger work.

J. R. T.-B.

EDITORIAL.

CURIOUS THINGS.

The informed observer of certain present tendencies in descriptive entomology finds himself in a most confused frame of mind. There are at least four currently advocated imprescriptible principles of this discipline of the science (and probably very many more which have not as yet received the *imprimatur* of our entomological *pontifices*). These are:

1—That all descriptive entomologists have a college degree;
2—That no description shall be valid without a drawing;
3—That *external* genitalia must be the criteria of species;
4—That *internal* genitalia must be the criteria of species.

There is an apparently substantial force to these—on the surface. But in spite of the gorgeous uniforms, the bundles of straw that stuff these elegant images—*eidolons,* if you will—persist in showing at ankle and elbow, with a weird aspect of torticollis above the shoulders.

Let us consider these ideas in the order of their enumeration. Look on the degree: Is it any guarantee whatsoever that a divine spark shall not die? Is it in any way an assurance that its holder has either the philosophical criteria or the very practical discrimination needed to descriptively distinguish one form from its near congeners? And granting that he has either or both, his adequacy depends strictly on an extensive and exact knowledge of the morphology of an entire group—not merely on the ability to count antennal joints or such-like *minutiae.* In short, the man makes the degree, not the degree the man. In a degree, in fact, we merely get a certificate that we have done certain limited things—it does not guarantee any future performance. And more, the lowly worker without a degree may show a far greater aptitude and gift. So, why cut him off? In short, what such a proposition would do if carried out would be to establish a rigid, self-sufficient, scientific oligarchy, self-perpetuating, as all oligarchies of whatever strain. The Republic of Science would lie in ruins at the feet of a dictator. But:

"The rank is but the Guinea's stamp—
The man's the gowd for a' that."

Let's put the microscope similarly on proposition no. 2. Let *all* entomologists who can draw adequately raise their right hands—ah, yes; there are a few who are able. But what of all the others? Must they be debarred from descriptive work because they can't wield a satisfactory pencil? And if they get someone else to do it for them, is it anywhere implied that these draftsmen shall be strictly accurate in their delineation and that they have omitted nothing, added nothing and improved on nothing? Of course, we always hope for scientific honesty and are most seldom disappointed, but any one who has read thus far can surely bring to mind an occasional lapse from rectitude. And the vast honest majority are no more immune from errors in drawing that they are from errors in writing. And here again we come upon our fundamental factor—the man.

When we come to numbers 3 and 4, we have the two faces of the coin—that one of them is correct does not denote that the coin is genuine. The general fallacy here rests on the idea that all men are equally endowed with an absolute technique, identical and parallel in all ways; and that being thus endowed, each man can infallibly duplicate such technique to the last imponderable degree of accuracy. In such wise, in any group of men working on *fixed and unchangeable living beings,* all and every one will get absolute, fixed and positive results. Yet it seems almost a truism to point out to any group of biologists, that life and living things being a flux, what we elucidate are merely static points in a continuum; therefore, we cannot expect identical results except under absolute identity of all factors—biologist, specimen, technique—even so ordinary a thing as light! If the specimen be the same, each entomologist sees it differently; and draws it differently, because of the personal equation of each man. And not only this, but the maturity of immaturity of a specimen is a controlling factor of vast importance; and how is any one to know *this* element?

In fact, how can genitalia, internal or external, be the only criteria of a species? As a single element, of no more value than any other valid structure, and to support other findings, these organs are of great value; but to make them the be-all and end-all of descriptive entomology, that is quite another matter.

In fact, the whole frame of mind revealed in these propositions is akin to that of the mystic adepts of alchemy, searching for the Elixir of Life and the Philosopher's Stone, which last would turn all metals into gold. And not only that, but the mysteries were to be revealed only to the initiate, who alone were worthy to know them; and who alone would enjoy the fruits of their labors in unending life and inexhaustible fortune. The uninitiate could go to the Devil!

J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of April 11, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 11, 1935, at 8:10 p. m. President Davis in the chair and eight other members present, namely, Dr. Tulloch and Messrs. Kaiser, Lemmer, Moennich, Rau, Sheridan, Shoemaker, and Siepmann; and the Misses Kaslow and Lauterstein, Dr. Henry Fox, and Messrs. Dietrich, Gerberg, Friedland, Hobart, Karish and Stecher.

Mr. William T. Davis spoke on the Orthoptera of New York State, and reported two species new to the state, both of which were obtained on Staten Island. One of these was the mantis, *Paratenodera angustipennis,* and the other, a coral-winged locust, *Pardalophora phoenicoptera,* the latter species being common in the vicinity of Lakehurst, N. J., but not having been previously recorded from New York. Mr. Davis exhibited specimens of all the Orthoptera occurring in the state, 136 species in all, and said, that aside from the two additional species he reported, and a species that is found in greenhouses, no additions have been made to the New York State List in the order Orthoptera.

Dr. Henry Fox said that as far as he knew, *Paratenodera angustipennis* was the only species of Orthoptera that could be added to the New Jersey State List.

Dr. Tulloch spoke of his trip into the interior of Alaska which he made in order to study the mosquito problem for the gold mining companies. The mosquitoes are so numerous and troublesome in this region that they appreciably reduce the efficiency of the men engaged in the mining operations, and an attempt was made to effect some measure of control, so that the number of days on which it would be necessary for the men to wear nets could be reduced.

This region, which is near Fairbanks, is above the tree line, and the vegetation consists largely of tall grass and similar plants. The land is comparatively flat, but there are numerous ponds, pools and water holes, some of them originally the diggings of prospectors in search of gold. These pools furnish ideal breeding places for the mosquitoes. Dredging operations have tended to reduce the number of these pools, so that there is a noticeable difference in the number of mosquitoes at different mining camps.

Experiments were made regarding the mosquito's preference for certain colors, but no information of value in their control could be obtained working along this line. One method of control suggested was to burn large areas of grass, permitting the sun to get in and dry up the pools. This afforded a slight measure of control, but did not afford a complete solution to the mosquito problem.

Dr. Tulloch illustrated his talk with lantern slides showing the mosquitoes, topography, roads and mining operations of this region. Mr. Sheridan moved that the society vote Dr. Tulloch a vote of thanks for his entertaining lecture, which motion was duly seconded and carried.

The meeting adjourned at 10:20 p. m.

CARL G. SIEPMANN,
Secretary.

MEETING OF MAY 16, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, May 16, 1935, at 8:15 p. m.

President Davis in the chair and twelve other members present, namely, Messrs. Cleff, Engelhardt, Lacey, Lemmer, McElvare, Moennich, Ragot, Rau, Risch, Shoemaker, Siepmann and Dr. Tulloch; also, Mrs. Shoemaker, Dr. Henry Fox, and Messrs. Angell, Dietrich, Friedland, Gerber, Halbert, Heitzmann, Placek, Richter, Schwartzberg, Jerome Sherman and Stecher.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the report of the Treasurer and read a letter from the editor, which were placed on file.

Mr. Davis reported *Tibicen lyricen* var. *engelhardtii* Davis as having been collected by Mr. Roy Latham at Orient. This is a new record for Long Island.

Dr. Henry Fox spoke on the distribution and natural spread of the Japanese beetle, illustrating his talk with lantern slides. In order to understand the present distribution of the Japanese beetle, he said, it must be recalled that it has been and is being disseminated by two methods; first, natural spread or flight, and second, artificial conveyance. Human agency is by far the most important factor facilitating the spread of the beetle, and it is on this account it is found in scattered territories, usually in towns and cities close to railroad yards where shipments have been unloaded. The beetle has a strong tendency to say where it is and is a very slow spreader. By the end of 1934 the greatest distance the beetle had spread by natural means was to Cape May, N. J., a distance of 75 miles in 15 years. To the northeast the greatest spread has been to Rockaway Beach, L. I., only 70 miles. The natural spread has been more rapid toward the east and less so toward the west, probably due to the direction of the prevailing summer winds, but the spread of the beetle has been limited on the east by the ocean. The greatest spread by artificial means, on the other hand, has been to St. Louis, Mo., a distance of approximately 800 miles.

Owing to these two methods of dissemination, the area of apparent infestation consists of an area of continuous infestation, due to the natural spread, and a much more extensive area of discontinuous or localized infestation due to the development of new colonies from individuals carried by artificial means.

In 1919 the area of infestation was limited to the extreme western part of Burlington County, N. J., a small area between Riverton and Morristown, only a limited part of Camden County, and a little colony on the banks of the Delaware northeast of Philadelphia. By 1925 the area of infestation extended north to Mercer County, eastward to the western part of Ocean County, and southward to northern Atlantic County and the middle of Gloucester County. The region of heaviest infestation was localized near the area of original infestation. The natural spread was very slow, especially when compared, for instance, with the Mexican Bean Beetle, which spread from Alabama in 1920 to New York City in 1928. The spread eastward was noticeably greater than to the west, being intermediate to the north and the south. The greater spread eastward is all the more remarkable because most of the region east of Riverton, N. J., consists of pine barrens, which are not congenial to the Japanese Beetle which is partial to lush vegetation such as pastures, golf courses, lawns and parks.

In 1926 a faint lightening of the degree of infestation was evident in the center of the original area; it was heaviest in a zone forming a ring around the original center. This formation of a ring around the original center, and a lightening of the area of heaviest infestation after a few years is characteristic of the spread of the Japanese Beetle. The spread eastward was practically to the ocean; to the west the city of Philadelphia acted as a barrier to the spread of the beetle. All large cities, while favoring the artificial spread of the beetle to new centers, hinder the natural spread of the insect.

By 1927 further spread of the beetle was evident, reaching northern Delaware on the south. The area of infestation in the New Jersey Pine Barren region was spotty, due to lack of suitable conditions in parts of this region.

By 1928 the original area of infestation was cleared up, the heaviest infestation was reduced from a band around the original area to broken fragments.

In 1930 much artificial spread of the beetle was evident in New Jersey, especially in parts adjacent to New York City, and new colonies were being formed. A further tendency of the heavy zones of infestation to break into fragments was noted.

In 1931 the area of greatest concentration was seen avoiding the pine barrens and going in a northeasterly direction towards Middlesex County.

In 1932 the lower part of Cumberland County and a part of Salem County were in the regions of heaviest infestation. Local colonies were springing up in Delaware due to artificial dissemination.

In 1933 beetles were carried to the sea and cast up on the seashore of Long Island. Some may have survived and started new colonies. The western edge of the infested area, in Pennsylvania, was sinuous in shape, due to the hilly nature of the country. Hills are not favorable to the spread of the beetle, and it has a tendency to follow the valleys. The following year the Elkton and eastern spreads of the Japanese Beetle were joining. Cumberland and lower Salem counties were the areas of heaviest infestation.

The spread of the Japanese Beetle is very likely to be limited to east of the 100th meridian. Further west conditions are very different from those of Japan. Our western states are dry through much or the whole of the year, and the Pacific Coast has dry summers. A dry summer fails to supply enough moisture to the eggs and young larvae and may prove fatal to the beetle. Dry winters, such as occur west of the Great Lakes down to Iowa may be characterized by a spell of severe cold coincident with the absence of snow. This absence of a protective coat of snow during a cold spell would be fatal to the larvae in the ground.

The Japanese Beetle occurs in Brooklyn, Greenwood Cemetery being heavily infested and Prospect Park lightly so. Dr. Fox said that Brooklyn may expect an augmentation of this infestation during the next few years.

Mr. Ragot distributed copies of the *Entomological Exchange Bulletin* announcing the offiering for sale of the collection of Coleoptera made by the late Mr. Charles Schaeffer. Mr. Ragot intends to publish this bulletin now and then to list entomological material for sale or exchange or to assist collectors to locate needed specimens.

The meeting adjourned at 10:20 p. m.

CARL GEO. SIEPMANN,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

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Vol. XXXI APRIL, 1936 No. 2

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OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

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Vol. XXXI April, 1936 No. 2

A REVIEW OF THE SUBGENUS NOMARETUS LE CONTE OF THE GENUS SCAPHINOTUS DEJEAN (COLEOPTERA-CARABIDAE).

By Edwin C. Van Dyke, University of California,
Berkeley, California.

Nomaretus was established by Le Conte[1] in 1853 as a genus of the tribe Cychrini for the reception of *Cychrus bilobus* Say and two new species, *fissicollis* and *debilis,* the chief differential characters being the presence of only two completely glabrous basal segments to the antennae as against the usual four glabrous segments and but eleven more or less complete striae to each elytron in contrast to fourteen. In 1859, Le Conte described *cavicollis* as a fourth species; and following this, Horn, *imperfectus* in 1860; Schwarz, *hubbardi* and *incompletus* in 1895, Beutenmueller, *schwarzi* in 1913; and Casey, *tenuis* in 1914. In 1907 Roeschke[2] made a careful study and revision of the tribe Cychrini from the world standpoint. In this work, he placed *Nomaretus* as a subgenus of the genus *Scaphinotus* of Dejean, retaining all of the species in the subgenus that had been previously placed there. Later Casey (1914) established the genus *Maronetus* for the smaller, non-metallic species which had but two marginal setae to the pronotum. Thus *Nomaretus* was left with but three species as shown in the Leng Catalogue. A fourth species will be added in this paper.

I consider that Roeschke was right in assigning but three North American genera to the tribe Cychrini; *Cychrus, Scaphinotus* and *Sphaeroderus.* These three are readily separated by fundamental characters. All of the other groups listed by Leng as genera were placed by Roeschke as subgenera of *Scaphinotus* and correctly so,

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[1] Tr. Am. Phil. Soc. (2) X, 1853, p. 399.

[2] Monographie der Carabiden-Tribus Cychrini, Anns. Mus. Hungarici V, 1907, pp. 99–277, Tab. IV.

[illegible]

for though they differ more or less one from another, their differences are but of a minor nature. They gradually grade into each other or at least very closely approach one another. *Nomaretus* Le Conte is one of these subgenera. *Pseudonomaretus* Roeschke and *Maronetus* Casey are moderately close relatives but distinct entities, and therefore placed as independent subgenera. These three subgenera, like all of the subgenera of *Scaphinotus* were evolved in different parts of the country. *Pseudonomaretus* had its origin and evolution in the region of eastern Washington and northern Idaho, in a region which undoubtedly persisted as a sort of island within a sea of ice during the Great Ice Age. *Maronetus* is restricted to the middle and southern Alleghanies. This territory was also but little affected by the Ice Age so was able to preserve the highly specialized and delicate members of this subgenus. *Nomaretus* was also probably restricted to a great degree to a definite territory, the great Ozark Uplift, during the period. Most of the present day species are to be found in the neighborhood of this region. Only one has wandered far afiield. This species, *bilobus,* was no doubt more mobile, so was able to follow the retreating ice northward to the region of the Great Lakes and even eastward into the mountains of New York and the White Mountains of New Hampshire. None of the members of the genus were ever members of the true Atlantic or Alleghany faunas. *Nomaretus serus* Scudd. from the Oligocene deposits of Florissant, Colorado, in spite of the fact that Scudder compared it with *imperfectus* Horn, now placed in the subgenus *Maronetus,* I believe must have belonged to the true *Nomaretus.* The illustration given by Scudder looks more like a member of the latter subgenus than one of *Maronetus.* Besides I do not believe that any member of the latter could ever have extended as far west from the Alleghanies and not leave a modern representative somewhere in intermediate territory.

Nomaretus as now limited might be defined by having the head elongate; genae simple, not dilated and without a tooth or incisure in front of the eyes; clypeus without lateral grooves; labrum deeply bilobed, with inner margin of emargination entirely confined to it, not invading clypeus, and with four setae; antennae with, at most, two and a half of the basal segments glabrous; pronotum with more than two marginal setae (multisetose); elytra with eleven complete striae to each elytron; elytral epipleura coarsely punctured; and male tarsi dilated.

The most distinctive character of this subgenus is the multisetose margin of the pronotum, a character which it alone possesses, and which is always indicated by the setal punctures even if the setae are removed. Other special features are the reduction in number of complete elytral striae to about eleven and the reduction in number of glabrous antennal segments. The most closely related subgenera, *Pseudonomaretus* and *Maronetus* both have the lateral pronotal setae two in number, one at the middle of the sides and one at the hind angles as is usual in other Cychrini and four basal segments of the antennae glabrous. In the first subgenus, the number of elytral striae is greater than eleven and in the second generally much less. The species of *Nomaretus* are all brilliantly metallic above, of a cupreous or violet color, rather small and superficially suggesting *ridingsi* Bland of the subgenus *Irachroa* or *canadensis* of the genus *Sphaeroderus.*

Key to Species.

1. Elytral striae deeply impressed, the strial punctures moderate in size and somewhat approximate; prothorax one-third broader than long, with sides broadly rounded in front, less arcuate and convergent behind, with obtuse or feebly rounded hind angles, and the disk smooth in front . . *bilobus*

Elytral striae feeble or at least not deeply impressed, the strial punctures large and well spaced 2

2. Prothorax quite transverse, almost one-third broader than long, the sides rather evenly arcuate throughout, with broadly rounded hind angles, disk smooth in front; elytral striae very feeble but with strial punctures very large and in most cases widely separated . . . . *liebecki*

Prothorax cordiform, but little broader than long, with sides distinctly convergent posteriorly and hind angles obtuse and subangulate; the elytral striae regularly and feebly impressed and with strial punctures moderately large and well separated 3

3. Disk of pronotum smooth in front . . . . *fissicollis*

Disk of pronotum with numerous setigerous punctures in front. *cavicollis*

Scaphinotus (*Nomaretus*) *bilobus* (Say). Plate III, figs. 4, 4a.

Of moderate size, black, pronotum and elytra metallic violet or aeneous. Head with post ocular constriction deep, the first and second antennal segments and basal half of third glabrous. Prothorax broadly cordate, one-third broader than long, apex feebly emarginate, sides broadly rounded in front, feebly arcuate and convergent behind, hind angles subangulate and very obtuse, base distinctly emarginate and but little less broad than apex, disk with median line deeply impressed, the areas on either side convex, smooth and without punctures, basal impression large, irregularly and coarsely punctured, the lateral grooves with numerous setiferous punctures (setae often removed). Elytra elliptical, humeri well rounded but moderately prominent, striae deeply impressed and crenulate, the strial punctures rather small and somewhat approximate. Propleura sparsely, irregularly punctured below in front and behind, and epipleura coarsely, more or less confluently punctured and rugose. Length 13–14 mm., breadth 5.5 mm. Front tarsi in males broadly dilated, a large triangular area at apical half of first segment and segments 2–4 papillose beneath, the fourth less distinctly so.

This species is the largest of the subgenus, averaging about 14 mm. in length, and the most northern in distribution. Its distinctive features are the breadth of the prothorax, smooth and shining pronotal disk in front, sharply impressed longitudinal line, deep elytral striae with rather fine, approximate punctures and rugose epipleura with confluent punctures. A greater area of the third antennal segment is glabrous than in other species and a much greater area of the first tarsal segment of the front legs in males papillose beneath than in any of the species except *fissicollis*. Say's original localities "Missouri" no doubt referred to what is now northern Nebraska, and "Northwestern Territory" to the present Minnesota. Other known localities are the Lake Superior region, Marquette, Michipicoten Island and Isle Royal; Canada; Ohio; the Catskills, Whiteface and Wallface Mountains, and near Buffalo, New York; and the White Mountains of New Hampshire.

Scaphinotus (Nomaretus) liebecki Van Dyke n. sp. Plate III, figs. 1, 1a.

Rather small, simulating *fissicollis* in size, piceous with pronotum and elytra, a brilliant metallic violet. Head with post ocular constriction moderately deep, first and second antennal segments and base of third segment glabrous. Prothorax almost a third broader than long, broadest in front of middle, apex slightly emarginate, sides broadly and rather evenly arcuate, but feebly convergent behind, hind angles broadly rounded, base transverse and almost as broad as apex, disk with median longitudinal line sharply impressed, the area on either side convex, smooth and without punctures, basal impression large and coarsely punctured and lateral grooves with numerous setigerous punctures though but two setae to each side remain on the type specimen. Elytra elliptical, humeri broadly rounded, striae obscurely impressed but the strial punctures large and in most cases widely spaced. Propleura behind and epipleura coarsely punctured but not rugose and with punctures well separated. Length 12 mm.; breadth 4.75 mm.

Front tarsi of male moderately dilated though less so than in either *bilobus* or *fissicollis* and with but a small triangular area at apex of first segment papillose beneath and segments 2–4 as usual fully papillose beneath.

Holotype (No. 4110 Mus. C. A. S. Ent.), a male bearing the label "Tex." received from Charles Liebeck, for whom it is named as a token of regard and in recognition of his able entomological work and numerous favors. Two other specimens likewise labeled "Tex." received from Charles Leng are designated as paratypes. These latter also carry a Schaupp tag, so I judge were collected by him.

This species may have been seen before but confused with the other species. It is of the same general size as *fissicollis* and *cavicollis* and in color and appearance also somewhat similar. It differs from these primarily by having a much more transverse prothorax, not cordiform, less sulcate dorsally, with the sides rather evenly arcuate, not almost straight and convergent behind, by the base being almost as broad as apex, and the hand angles broadly rounded, not subangulate, the humeri slightly more evident, the striae hardly impressed, evidently so in the others, and the strial punctures larger and in general more widely spaced. The epipleura are also less wrinkled and the punctures more evenly separated. From *cavicollis* it also differs by lacking pronotal setigerous punctures on the disk. The larger size, more narrowed prothorax behind, subangulate hind angles, deep elytral striae, smaller and approximate strial punctures, and rugose epipleura with more or less confluent punctures, will readily separate *bilobus* from this species. It is possible that all Texas specimens of *Nomaretus* are of this species.

Scaphinotus (*Nomaretus*) *fissicollis* Le Conte. Plate III, figs. 3, 3a.

Medium sized or small, black with front of head, pronotum and elytra a brilliant metallic violet. Head with post ocular constriction marked, first and second antennal segments and base of third glabrous. Prothorax cordate, but slightly broader than long, apex slightly emarginate, sides broadly rounded in front, almost straight and convergent behind, hind angles obtuse and subangulate or slightly rounded at apices, base feebly emarginate or almost transverse and about three fourths breadth of apex, disk broadly sulcate and with deeply impressed median longitudinal line, the lateral areas convex, smooth and impunctate, basal impression deep and irregularly, coarsely punctured, lateral grooves with numerous setigerous punctures. Elytra elliptical, humeri reduced, striae feebly impressed but strial punctures rather large, deep and separated. Propleura irregularly punctured behind and epipleura coarsely, not closely punctured and moderately rugose. Length 11–12 mm., breadth 4–4.5 mm.

Male front tarsi moderately dilated with a triangular area extending from just beyond middle to apex of first segment and the greater portions of segments 2–4 papillose beneath.

This species is in general one of the smaller species, most closely resembling *cavicollis,* especially as regards the narrow cordate prothorax, but differs primarily in having the front portion of the disk without punctures. The elytra are also slightly narrower and more elliptical and the strial punctures somewhat finer. It ranges from southern Illinois through eastern Kansas (Argentine) and western Missouri (Kansas City, Peeveley), to Texas. The last mentioned locality is taken from the general literature. It is probable that the specimens bearing this locality label are really *liebecki.* I am indebted to Dr. P. J. Darlington, Junior, for carefully reexamining the type of this species for me.

Scaphinotus (*Nomaretus*) *cavicollis* Le Conte. Plate III, figs. 2, 2a.

Medium sized or rather small, black with front of head, pronotum and elytra a brilliant metallic violet. Head with post ocular constriction pronounced, first and second antennal segments and generally base of third glabrous. Prothorax cordate, but slightly broader than long, apex feebly emarginate, sides arcuate, markedly in front, almost straight and convergent behind, hind angles subangulate and obtuse at apices, base almost transverse, disk broadly, shallowly sulcate. Median longitudinal line finely impressed, lateral areas more or less smooth and shining behind, irregularly pitted with setigerous punctures in front, basal impression deep and irregularly, coarsely punctured, lateral grooves with numerous setigerous punctures. Elytra elliptical, humeri reduced, striae somewhat feebly though distinctly impressed and strial punctures coarse and separated. Propleura coarsely punctured behind, epipleura very coarsely and irregularly punctured and feebly rugose. Length 11–12 mm., breadth 4.5–5 mm.

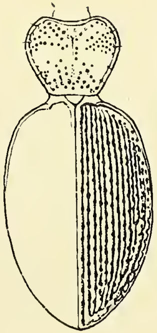
Male front tarsi moderately dilated with a small triangular area at the apex of the first segment and the greater portion of segments 2–4 papillose beneath.

This species is always readily separated from its fellows by the fact that the pronotum is more or less irregularly punctured in front. As regards its size, shape of prothorax and elytra, it closely approaches *fissicollis*. Its male tarsal characters are much like those of *liebecki*. Its area of distribution is throughout eastern Kansas (Fort Riley, Douglas County, Lawrence), western Missouri (Kansas City), Arkansas (Rodgers), eastern Texas and Louisiana (Vowells Mills).

Explanation of Plate III.

Fig. 1. **Scaphinotus (Nomaretus) liebecki** n. sp.
Fig. 1a. Male front tarsus of **liebecki** n. sp.
Fig. 2. *Scaphinotus* (*Nomaretus*) *cavicollis* LeConte.
Fig. 2a. Male front tarsus of *cavicollis* LeConte.
Fig. 3. *Scaphinotus* (*Nomaretus*) *fissicollis* LeConte.
Fig. 3a. Male front tarsus of *fissicollis* LeConte.
Fig. 4. *Scaphinotus* (*Nomaretus*) *bilobus* (Say).
Fig. 4a. Male front tarsus of *bilobus* (Say).

Drawn by Mrs. Frieda Abernathy.



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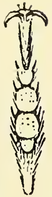

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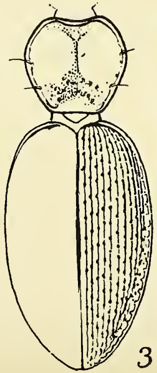

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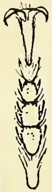

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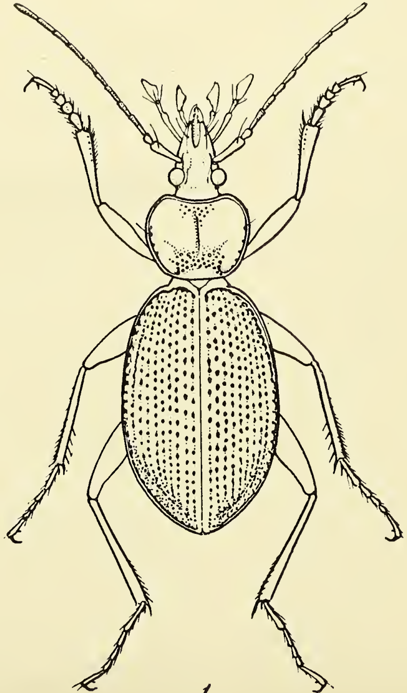

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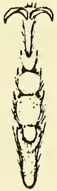

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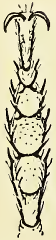

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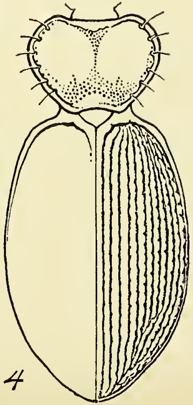

4

THE PROBABLE DISTRIBUTION OF TERMITES THROUGH GREENHOUSE PLANTS.

By Gordon MacMillan Kutchka, Carnegie Museum,
Pittsburgh, Pa.

It is of general knowledge that the commoner forms of greenhouse insects are distributed from greenhouse to greenhouse and to homes through the agencies of potted plants. Other forms of insect life, especially the household pests, have been, unintentionally, distributed by man, and more so since the time that he took to ocean navigation and land transportation on a commercial basis. Yet this type of distribution from one continent to another, as in the case of *Reticulitermes flavipes* (Kollar) from America to Europe, and *Reticulitermes lucifugus* (Rossi) from Europe to America, can be explained by involuntary migration in ships. In unpacking several cases of chemicals received from Germany at Leland Stanford University, Berkeley, Cal., a few years ago, scores of termites were exposed when the wooden boxes were broken up. The distribution of termites has occurred mainly through the commercial transportation of lumber and lumber products. Their route of migration has been from tropical through the semi-tropical regions to the temperate zone, until, today, they have become a menace to home owners and to persons owning large buildings. The fact that these insects may be distributed through the agency of potted plants seems to me to be a new clue to their present day spread.

During the Christmas season of 1934 the author's mother received a rather large *Poinsettia* as a gift. After having the plant in the house for nearly two weeks, she called my attention to some "grubs" that were crawling around the saucer in which the plant was sitting. Upon examination it was discovered that there "grubs" were workers of *Reticulitermes flavipes.* A few days later the *Poinsettia* was removed from the pot and examined. At the end of this procedure 113 specimens, 110 workers and 3 soldiers, had been gathered. This colony of termites had housed itself in the more compact soil around the roots of the *Poinsettia* and ferns. The loose soil contained small particles of wood and other sources of cellulose upon which the insects were able to subsist. It was impossible to trace directly the source of infestation in the plant from the greenhouse in which it was grown, as, upon investigation, there were too many houses and the superintendent of the greenhouse informed me that they occasionally found some of these insects in the boards of the benches. When such a discovery was made, the infested part of the bench was removed and destroyed.

In this particular case the *Poinsettia* may have been sitting on a board already infested with termites, from which they entered the pot through the drain hole, or some of the soil may have contained some of these insects. This condition was mentioned by C. L. Marlatt (1908), one time head of the Bureau of Entomology of the United States Department of Agriculture. He stated that in one instance termites, coming from the wooden benches, entered potted plants through the drain hole of the pot.

In a probable case the termites would remain in the flower pot until all the available forms of nutrition had been consumed, even going so far as to hollow out the stem of the *Poinsettia.* These insects would then start to migrate to other sources of food, most likely the stand upon which the infested plant had been placed.

Throughout the various references pertaining to this species of insect there are a few instances that are positive proof for the distribution of it through commercial agencies. These are quoted as interesting examples, but do not bear any direct relationship to the general theme of this paper.

J. C. Mellis, in his work on St. Helena, enters into a lengthy discussion on the enormous destruction of property on this island by a species of termite, *Eutermes tenuis* (Hagan). It is believed that his species was introduced in 1840 from a captured slave ship, as this insect was unknown on the island prior to that year. When this condemned slaver was dismantled at Jamestown, the timber was infested with this species of termite, a very common form found in Brazil.

In 1878 a Spanish man-of-war, returning from the Philippines, was completely destroyed by termites in the Port of Ferrol, Spain. This man-of-war was infested by a termite found in one of the many Philippine timber producing trees. V. L. Seoane (1878) noted that it was only the ships constructed of European wood that were attacked by these termites when in the Philippines, while those built of native timber were immune from the attacks.

The first mention of the possible distribution of termites by greenhouse plants was made in 1876 in an article published by Dr. H. A. Hagen in the *American Naturalist.* The North American termite, *Reticulitermes flavipes,* was found in hot-houses at Schoenbrunn, belonging to Emperor Joseph of Austria. These insects were believed to have been imported with plants from South America, the termites being found in the wooden tubs in which the plants had been sent. But this supposition is erroneous, as this species of termite has not been observed south of the North American continent.

There are many assertions of termintes being found in hothouses, not only in the wood of the benches, but also in well-manured soil and even in some of the plants growing in the benches. This type of soil is less compact and warm and contains the right amount of moisture needed for the medium in which the internal protozoa live.

Many entomologists and florists of the last half of the nineteenth century have reported, in various publications, the damage that termites have done to greenhouse plants. Those greenhouse plants attacked by these insects were mainly of the pithy kind, such as geraniums; such plants being easily attacked on account of the constituence of the main stem. In attacks of this kind every part of the plant except the outer skin and leaves is eaten, leaving only the hollow stem.

But these attacks of termites on living plants in the more temperate regions are typically sporadic and local, and are not known to be of economic significance. These cases owe their occurrence largely to the presence of unprotected dead wood through which the termites make their original entry.

Although the presence of termites in the pots of greenhouse plants and in the plants themselves is not considered to be of an economic significance, yet it is a very wise policy to destroy the termite-infested plant and pot to prevent the probable infestation of the house and furniture with these extremely destructive insects. If such an infestation should occur through this medium, not only the infested house, but also the greenhouse, the source of infestation, should be treated to prevent future infestation in neighboring houses through swarming, and to check the damage already begun in the infested area. But it can be said, with much assurance, that the actual infestation of homes and household property by termites through the agency of greenhouse plants is very slight, and that home owners need have no fear in purchasing potted plants at any neighborhood floral shop.

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FOSTER H. BENJAMIN.

Our Society, in full measure, shares with all entomologists the regret over the death of Foster H. Benjamin, one of the foremost students of North American Lepidoptera, which occurred on January 25.

This, however, expresses only in part our real feeling over the ending of an intimate association, which had its beginning 30 or more years ago. He was born in Brooklyn, and while still in the elementary grades, he was already interested in butterflies and moths; Foster H. Benjamin brought his collection and his troubles to the Children's Museum for thorough discussion and adjustment. His serious and painstaking application to this subject called for and received every possible assistance on almost daily visits, first to the Children's Museum and later to the Brooklyn Museum, until after his graduation from High School when he continued his studies at Cornell University.

His subsequent career and activities in the service of the Government will no doubt be recorded officially and more fully than we can do. His untimely death at not much over 40 years cuts short a career of great promise. We feel the deepest sorrow.

George P. Engelhardt,
Hartsdale, N. Y.

THE DESERT IN BLOOM.

By George P. Engelhardt, Hartsdale, New York.

(Excerpts from a discourse delivered at the meeting of the Brooklyn Entomological Society, December 12, 1935.)

A number of transcontinental collecting trips by the speaker in the past had for their primary purpose biological field investigations of the family Aegeriidae, or clear-wing moths, and hence were conducted during the Summer and early Fall. Thus there had been little opportunity for seeing something of the wild spring flowers, for which western deserts are famous. This then was the chief object of a journey begun at the end of March, 1935. A better year could not have been chosen. Preceded by copious winter rains, spring flowers appeared in a profusion and splendor not experienced in many years. The trip turned out to be a veritable botanical pilgrimage.

As usual, when travelling west over the southern route, a stop was made at Mobile, Ala., to visit with my good friends, Drs. H. P. Löding and Thos. S. Van Aller. It was still Azalea time and the city looked as if it had been painted red. We drove through the residential sections following the arrows marked "Azalea Trail" and then proceeded to the Bellingrath Gardens on Fowl River, 22 miles outside the city limits. On this large estate thousands of Azaleas, Camillias, Rhododendrons and other flowering shrubs have been gathered from all parts of the world. In the grouping of these plants full advantage has been taken of natural settings along the river banks, on the knoll above it with ancient, moss draped live oaks, in open glens and narrow ravines and around placid lagoons, mirroring the blaze of colors. These gardens have become the Mecca of nature lovers in the South.

At San Antonio, Texas, an outing with Mr. H. B. Parks, State Apiculturist, had to be curtailed on account of heavy rain. Our special quest had been for a *Megathymus* butterfly, discovered by Mr. Parks breeding in the crown and root of the *Agave manfreda,* a low-growing, small plant with fleshy leaves and a flower stalk 2–3 feet high. Only one example of this butterfly has been obtained so far and it is likely to be an undescribed species. This specimen has been submitted to Dr. John A. Comstock of the Los Angeles Museum. The foodplant is restricted to Texas. It is quite common in the Nueces River region and occurs in scattered colonies near San Antonio. By the time we had found a colony showing signs of infestation the rain soaked black adobe soil of the place had become like glue, sticking to one's shoes in clods weighing many pounds. Work had to be discontinued. It was observed that the larvae, boring in the leafy crown of the plants, upon reaching full growth, ascend and hollow out the flower stalks for some distance, where they prepare a circular exit hole, which again is protected by a closed tube of chips and silk, extruding one half inch or more.

The Megathymus butterflies, also known as the Yucca borers, are looked upon by most collectors as great rarities. Very swift in flight and extremely wary, they are not easily captured. Of the ten or more species recorded from North America two are found in the southern States; the others are western. Biologically they fall into two main divisions—those that bore in yucca, attacking the crown root and stalk, and those that bore in *Agave,* usually confining themselves to the fleshy leaves, several larvae often tunnelling in one leaf, when the plants are large enough. Their presence is easily recognized by perforations and frass, thrown out in pellets. Dr. John A. Comstock of Los Angeles and Commander C. M. Dammers of Riverside have done splendid work on the life histories of California species, but much field work remains to be done in the Rocky Mountain regions, in Arizona and in Texas.

A week's sojourn at Tucson, Arizona, primarily signified a joyous reunion with our Editor in Chief, J. R. de la Torre-Bueno, and in meeting faculty members of the University, all men well versed in the flora and fauna of their state; hence sources of much information on excursions afield. Owen Bryant, one of our Society's members of long standing, was found in his new residence in the foothills outside the city limits, busily engaged on the rearrangement of his enormous collections from British Columbia and the Arctic regions, to which now he is adding much western material, including nightly captures in trap lights on his porch.

Tucson is favorably located for diversified collecting. On the level, sweeping valley floor one can meander comfortably among the scattered shrubby and usually thorny vegetation. *Opuntias,*—nopal and cholla cacti—were blooming early in April. Ocotillos displayed their flaming torches on long, slender rods and the white, bell shaped flowers of yucca in heavy clusters reached far above the narrow lance-shaped leaves. There were open stretches, miles and miles of them, covered with purple lupine, yellow poppies and pink verbena. Sahuaros, the giants of all cacti, appear to favor the foothills and steep, rockbound slopes. There they stand, weird yet fascinating, their massive trunks, 30 or more feet in height, like totem poles or huge many-branched candelabra. One wonders how old they are. Probably as old as or older than the gnarled oaks and junipers, which grow in the canyons. The horizon in every direction is formed by stark, jagged mountain ranges, some of the highest still showing patches of snow along their serrated summits. As seen from the valley, they give no indication of the fine woodlands and meadows to be found in high elevations.

An early Spring, an abundance of flowers, and warm sunny weather one would expect to be accompanied by lots of insects. To some extent this is true, particularly so of Hymenoptera and Diptera, but among the other orders the representation is disappointing. After all, the season for early spring flowers in hot, arid regions is brief, almost ephemeral and not always dependable. As a consequence, many insects after hibernation enter another period of estivation, completing their development when the rains of late Summer or early Fall have set in. Their date of emergence is apt to be much later than that of identical or related species living in a moist, temperate climate.

On trips with Prof. A. A. Nichol, University of Arizona Range Ecologist, and one of the best all around naturalists I have ever met, we made special search for a clear wing moth (Aegeriidae) known to breed in the basal stalks of a mistletoe, common on oaks in canyons of the Santa Rita Mountains and in the Oro Blanco Mountains near the Mexican border. Numerous cuttings obtained and mailed east, showed fresh borings not only of the clear wing moth, but also of beetles—Cerambycids and Buprestids, but from the whole lot only one insect emerged in July and that a fine, large, black clerid beetle. Which of the several boring insects served as prey to the clerid could not be determined. Better results, no doubt, would have been obtained, had the cutting been collected in July instead of April. Closer study of mistletoe and its insect guests should result in discoveries of much interest.

On the way to Ruby, a mining settlement in the Oro Blanco Mountains, we observed on shrubs of catsclaw (Mimosa), round, woody galls and protruding from them the empty pupal shells of the little black clear wing, *Synanthedon prosopis,* evidently emerged during March. From galls taken along only one example came out within a few days. It is the only Aegeriid collected so early in the Spring. In the Davis Mountains of Texas, this species does not emerge until late May and June. The name *"prosopis"* is misleading, as the insect does not breed in galls on *Prosopis* (Mesquite). Another observation of interest was the number of *Agapema* cocoons, in some instances clusters of a hundred or more, congregated in the midst of bushes so thorny as to afford a safe retreat from the attacks of enemies, whether biped or quadruped, feathered or furred. The moths are out during the fall.

At Yuma, J. L. E. Lauderdale, State Entomologist, kindly arranged a number of outings comprising the principal points in the topography of his region. We collected among the dense thickets along the banks of the Colorado River and crossed into California for a view of the famous sand dunes, which in places rise to a height of 200 feet and, bare of vegetation, stretch along for many miles like the waves in a heaving sea. In the movies, these sand dunes serve generally to illustrate scenes in the Sahara Desert. South of Yuma we visited the mesa, now transformed into orchards, producing citrus fruit, particularly grape fruit, unexcelled in quality and flavor and in cheapness.

Mr. Lauderdale had been on the lookout for a kind of nocturnal lizard, belonging to the family of Geckos, of which a single specimen, possibly a new species, had been left at his office. We hoped to find it among the ruins of old adobe buildings not far from the Gila River. But this ended in disappointment. We only ran across a four foot rattlesnake.

Entomologically, our best discovery was made on the return to town, when along an irrigation ditch we found in the roots of a mallow (*Sphaeralcea incana*) the larvae of an Aegeriid in various stages of growth. Subsequently, upon breeding from cuttings sent east, it turned out to be *Zenodoxus palmi,* a large, handsome species, known up to recent years only by the unique type, labelled "Arizona" and described 50 years ago.

On the day of departure, with the train for California not due until well after midnight, the long evening was spent profitably by collecting insects at light under the loggia of the Hotel Del Ming, opposite the depot. Quite a harvest of interesting moths, Myrmeleonids, Orthoptera and other insects was obtained.

A warm welcome awaited me at Riverside, Calif., by my good friend, Fred Winters, of the Mission Inn. He introduced me to Mr. and Mrs. John L. Sperry and to Commander C. M. Dammers, all entomologists of long experience. Commander Dammers, cooperating with Dr. John A. Comstock of the Los Angeles Museum, is doing excellent work on the life histories of California butterflies and moths. His drawings and paintings bespeak high artistic ability. The collection of Mr. and Mrs. Sperry excels in long, beautiful series of North American Lepidoptera. Especially noteworthy are their series of butterflies obtainable only above timberline and in the Arctics. Mr. Winters, in his limited spare time, continues his hobby of long standing—the water beetles of the family Hydrophilidae.

When at Riverside no one should neglect a visit to the Citrus Experiment Station, just outside the city limits. In every respect —buildings, equipment, working facilities and natural setting—it is the finest institution of its kind.

A trip into the Mojave Desert with Commander Dammers and Mr. Winters on April 12 will stand out always as a memorable event. On a previous visit in midsummer this same desert left an impression of utmost desolation. Vast, parched stretches, as far as the eye could see; heaps of black volcanic rock, deposited in chaos; dry lakes, their alkali encrusted surfaces glistening blindingly in a burning sun; nowhere a vestige of green vegetation. What a contrast in the Spring of 1935!

Encouraged by rain, plant life, which otherwise may remain dormant for years, covered the desert in an amazingly colorful profusion. It seemed worth crossing the continent to see. Joshua trees, in colonies here and there, featured their grotesqueness, but otherwise the flora comprised mostly low growing plants, some of the loveliest only an inch or two high. The nearest approach to the display of desert spring flowers may be found in Alpine meadows or in regions of the Arctic. For exquisite beauty these two extremes have no rivals.

Insects, it was noted again, were not numerous—Hymenoptera and Diptera to be sure, but so few butterflies. On white and on yellow blossoms, suggesting dandelions, we found, often mated, two pretty, small species of moths, since determined by Foster H. Benjamin as *Heliosa pictipennis* and *Heliophana modicella,* new variety. Often, also, there would be a whir, caused by the hawkmoth, *Clerio lineata,* taking flight. The caterpillars of this moth, according to reports, occurred in agricultural districts in such numbers as to form armies, which, marching to new feeding grounds, were trapped in trenches and destroyed, bushels at a time. The fine examples of the rare hawkmoth, *Euproserpinus phaeton* (shown at the meeting), were collected by Commander Dammers in February. Digging down to the roots of false buckwheat (*Eriogonum*) in search for Aegeriid larvae, we unearthed a colony of 7 or 8 large, red-banded mutillids, all females. Congregating in this way does not appear to be a well established habit for this family of wasps.

On entering Commander Dammers' attractive home in the orange grove on Victoria Avenue, one is at once aware—here lives a naturalist. His equipment for entomological research is elaborate and practical. His breeding experiments are carried on indoors, as well as out of doors, and many foodplants are growing in his garden. After returning from the Mojave Desert, we had several successful trips reconnoitering for good plants of clear wing moths. Boring in the vines of *Clematis ligusticifolia,* we found the larvae of *Alcathoë verrugo,* race *californicus,* an orange colored moth described from Central America, but represented by geographical races northward along the Pacific Coast into Southern California. The moths are extant from late June to August. Very few examples had ever been collected prior to the breeding of a large number from Arroyo Seco, So. Pasadena, several years ago. The same lot of pupae produced not only the normal orange form, but also a number, both sexes, which were lustrous, deep black, and so contrasting, that ordinarily, in the absence of intermediates, one would assign them to a different species. During the past summer, Commander Dammers and his friend, Theo. W. Hower of Orange, Calif., bred a large number of this borer, including several intergrades, beautifully connecting the orange and black color phases. This establishes beyond a doubt, that only one species is being dealt with. The black phase will be known as *Alcathoë verrugo californicus corvinus.*

The next base for field work was placed at Sacramento with H. H. Keifer of the State Department of Agriculture cooperating. His division had received from nurserymen, living plants of roses infested by borers in the rootstock. The borers, easily recognized as larvae of an Aegeriid moth, when bred through by Mr. Keifer in June, proved to be *Synanthedon bibionipennis*—the strawberry crown root borer, very destructive to cultivated strawberries and, to a lesser extent, to raspberries and loganberries on the Pacific Coast. Its attacks on roses had not been reported before. The insect is strictly western. *Potentillae,* as recently discovered, are its native foodplants. This should be included when remedial measures are considered.

Sacramento, notorious for summer heat, is a delightful city in the Spring. The park surrounding the State Capitol has splendid large trees, native and foreign, and they are labeled. So many of the ornamental shrubs and trees in California have been introduced, one wonders where they all come from.

Field work included trips into the mining sections of Eldorado County and to the petrified forest and the hot spring region at Calistosa in Napa County, where most of the California apples grow. It is a wonderful sight to pass through in apple blossom time. Among the wild flowers, lupine and poppy predominated.

Forest fires have been very destructive. While in our northern states fireweed (*Epilobium angustifolium*) takes possession of burnt over districts, in California, poppies follow the lanes of fire, covering the hills and mountain slopes with a golden glow.

Collections obtained at this time were rather limited and miscellaneous. In moist places, usually among white and lavender flowering bushes of *Ceanothus,* a black and white striped moth simply swarmed. Its extraordinarily long antennae, several times as long as the wing spread, readily placed it as a member of the Micropterygidae, an ancient family, considered a connecting link between the Trichoptera and Lepidoptera. None of the eastern species is so abundant.

At the California Academy of Sciences in Golden Gate Park, San Francisco, in the absence of E. P. Van Duzee, Curator of Entomology, I was welcomed by the Director, Dr. F. M. MacFarland. The Museum and the Steinhart Aquarium adjoining, if not among the largest, are second to none in the attractive, logical arrangement of their collections. A new hall devoted to habitat groups of African big game mammals was nearing completion. Dr. E. C. Van Dyke was found at the University of California, Berkeley, preparing for a collecting trip to Utah and Arizona. Then followed a long jump south with a short stop at Laguna Beach. Here lives the former editor of the Brooklyn Entomological Society, R. P. Dow. Years have not changed friend Bob. He remains the same tall, striking individual, long mustached and still signing himself—fideliter Dow.

At the San Diego Natural History Museum in Balboa Park one misses the Curator of Insects, the late Wm. S. Wright. It will not be easy to fill his place. From willow cuttings obtained in an arroyo near the park entrance were bred, some weeks later, fine examples of the Aegeriid moth, *Paranthrene robiniae.* In this same gully also were plenty of the butterfly *Apodemia mormo virgulti,* easily captured about their foodplant—false buckwheat (*Eriogonum*).

Only one more collecting locality remains to be mentioned. This is Jacumba, a small mountain town, elevation 2000 to 3000 feet, best reached by bus over the San Diego-Imperial Valley Highway. The Mexican border, a barbed wire fence, is within stone's throw. The chief attraction is an evil smelling and worse tasting hot sulphur spring, accredited with remedial properties. A comfortable hotel, a tourist camp, stores and saloons are strung along the highway.

Ever since traversing this region with Wm. T. Davis by train 5 or 6 years ago, I have retained memories of many tunnels and, in between, glimpses into deep canyons, their desolation heightened in the light of a full moon. Not a good prospect for collecting to be sure, yet somehow the place held a fascination and, if there were any insects, they should reflect the effects of so extreme a desert environment. Hence the stop at Jacumba. The deep, trailless canyons were found too distant for exploration in the time available. Daylight collecting in the vicinity of the town would have been fairly good, had it not been for the astonishing abundance of the butterfly *Vanessa cardui,* which, flying, fluttering, or resting everywhere, prevented concentration on anything else. What is the portent of such numbers? Was it a migration? The best collecting was done at night on the concrete arches of the tourist camp, which served as a resting place for insects attracted to the lights. A fine lot of moths—bombycids, noctuids and geometrids—not yet determined, were obtained.

Often I have been asked:—Why don't you stay and settle in California? Here you can live in comfort and enjoyment and here you can have close at hand any kind of environment and any kind of climate at any time of the year. It is a temptation. However, now at the end of April there is another Spring under way across the Continent. And what could be lovelier than the verdure clad hills of New York and Connecticut in early Summer and in the Fall? I feel the urge and hurry home to start work in my garden.

A Rare Aphodius.—Two examples of a dull reddish and curiously *Aegialia*-like *Aphodius* submitted to Mr. W. J. Brown of Ottawa have been determined as *Aphodius decipiens* Horn. Mr. Brown remarks that they are probably the only specimens known with the exception of the type. My examples were collected at Salmon Arm, B. C., in May, 1932; one was flying, and the other was just inside the burrow of a Columbia Ground Squirrel [*Citellus columbianus columbianus* (Ord)]. A third specimen was taken in a similar location in May, 1935—Hugh B. Leech.

SOME NEW GENERA OF LEAFHOPPERS RELATED TO THAMNOTETTIX.

By E. D. Ball, University of Arizona, Tucson, Arizona.

The tree and shrub inhabiting leafhoppers that have been referred in the past to the genus *Thamnotettix* are widely separated from the type of that genus and belong to a number of very distinct groups, part of which are herein named and defined.

Genus **Idiodonus** Ball n. gen.

Head narrower than pronotum, the vertex short, blunt, obtusely rounding and rounding over to front. Head as seen from the side very deep, deeper than the length of vertex and pronotum, face inflated, convex, the upper portion nearly vertical. Elytra long, venation simple, one cross nervure, the anteapicals long and narrow. Whole insect coffin-shaped, the elytra appressed and nearly vertical posteriorly. Species reddish, tawny, coppery or cinereous peppered with red. Vertex with two round spots just over the margin or peppered with red or both, often a narrow ivory band on pronotum and ivory lines on claval sutures. Usually a broad ivory or subhyaline margin to elytra, no "saddle."

Type of the genus *Thamnotettix kennicotti* Uhler.

This genus will include a very distinct group of tree or shrub inhabiting forms, including the list from *kennecotti* to *kirkaldyi,* which usually show metallic coloring and red spotting, a blunt head with two spots, a narrow ivory collar and triangle and a hyaline costa. The external genitalia are so near alike as to be of little assistance in separating species.

Genus **Colladonus** Ball n. gen.

Resembling *Thamnotettix* in venation and general form. Head conical, much narrower than pronotum, longer and more pointed but not as deep as in *Idiodonus.* Elytra appressed posteriorly giving a triangular appearance. Female segment usually deeply emarginate with a strap-shaped projection; male plates together long spoon-shaped. General color black, brown, or golden with metallic iridescence, usually with two black spots on vertex, an ivory collar or saddle or both and a hyaline or ivory costal area.

Type of the genus *Thamnotettix collaris* Ball.

This genus will include the group of highly ornamented typically tree and shrub feeding forms from *clitellarius* to *belli*, the greater number of which can be recognized at once by the broad collar or saddle or both.

Genus **Conodonus** Ball n. gen.

Resembling *Colladonus* in the narrow conical head, the closely appressed elytra and in the metallic golden and brown colors but entirely lacking the spots on vertex margins, the collar, the saddle and with only a trace, if any, of the hyaline costal area. They all have the excavated female segment and the elongated spoon-shaped male plates.

Type of the genus *Thamnotettix flavocapitatus* Van Duzee.

This genus includes another group of typically tree and shrub inhabiting species that, like *flavocapitata* and *juanata*, are almost uniform in coloring throughout while *aureolus* is brown with white elytra.

Genus **Gloridonus** Ball n. gen.

Resembling *Conodonus* but with a broader head, head as broad as the pronotum, bluntly conically pointed, acutely angled with the face. Elytra long, appressed, but inclined to flare a little towards apex. Venation typical *Thamnotettix* type. Genitalia widely differing from the "strap and spoon" type of *Conodonus*. The female segment truncate or emarginate in which case the emargination is heavily black bordered; male plates nearly flat long triangular or short, the spines on the last abdominal segment often long, exceeding the pygofers and plates. The styles of the type species are much like the horns on a water buffalo and curve around the tips of the plates.

Type of the genus *Thamnotettix gloriosus* Ball.

This genus includes the "g" group of iridescent golden or greenish tree or shrub inhabiting species nearly all of which have the ovipositors black in sharp contrast.

Genus **Doleranus** Ball n. gen.

Smaller, narrower and more conically headed than typical *Thamnotettix* with the simple venation of that genus but with the central anteapical cell somewhat constricted and then enlarged before the apex, the apical cells shorter than in *Conodonus*. The face has a large number of short arcs, the vertex a broken submarginal brown line and traces of crescents, pot hooks or ovals on each side of the disc. The pronotum has an irregular row of submarginal spots. The scutellum has two dots on the disc and the elytra have the veins margined with dark or the pigment aggregated into a few spots mostly on or adjacent to cross nervures and junctions. Any or all of these markings may be obscure. The female segment is usually emarginate but without a strap-like projection. The male plates are short or triangular but not folded up into a spoon-like structure.

Type of the genus *Thamnotettix longula* G. & B.

This group which includes *perspicillatus* O. & B. and a number of southwestern species, has affinities with *Recilia* Edw. on one hand and the recently described *Arundanus* of De Long on the other. The latter genus not only has the central anteapical cell constricted but also divided, and two cross nervures as well, while this group still retains the simple venation.

Genus **Ollarianus** Ball n. gen.

Resembling *Doleranus* but with a shorter broader head as wide as the pronotum. The vertex nearly twice as wide as the median length, nearly parallel margined. Resembling *Eutettix* but with the face rounder, the vertex shorter, with an inverted crescent of four black spots, the two outer ones larger and adjacent to the ocelli. There are usually two round black spots on the pronotum behind the eyes and a smaller pair on the margin of the scutellum before the apex. The species are golden or golden-green iridescent with the elytra subhyaline.

Type of the genus *Eutettix balli* Van Duzee.

This is another southwestern group containing a number of species, that is apparently related to *Recilia* Edw. and has branched off from a *Doleranus perspicillatus*-like ancestry to approach the *Eutettix* type of structure while retaining the spotting of the ancestral group.

Genus **Allygianus** Ball n. gen.

Large heavy bodied smoky brown or golden iridescent. Somewhat resembling *Allygus* but differing materially in most structural characters and entirely lacking the almost *Phlepsius*-like vermiculations of that group. Head as wide as pronotum but not as wide as the broad slightly flaring elytra. Vertex relatively short, broad and almost flat, acutely angled with the straight profile of face. Elytra inclined to be broad and flaring, venation strong with several cross nervures between the sectors and a large number of strong cross nervures on both clavus and corium. The nervures broadly and definitely light with dark margins, forming a large number of conspicuous quadrangular cells instead of weak and obscure, and inclines to have oblique cross-nervures as in *Allygus*.

Type of the genus *Thamnotettix gutturosus* Ball.

This is a small but very distinct western group without any very close affinities in the European or North American faunas.

Genus **Pasadenus** Ball n. gen.

Resembling *Allygianus* in the broad flat vertex and angle with face. Elytra still longer and more flaring, with broad almost truncate apices. Venation weak and obscure, much obscured by the distinct pattern of markings. Several cross-nervures between the sectors and weak reticulations on apical part of corium. Female segment emarginate but lacking the strap of *Colladonus*. Species highly ornamented, three brown bands, an ivory head and claval "saddle."

Type of the genus *Thamnotettix pasadenus* Ball.

Another very distinct western group which resembles the species of *Colladonus* but widely separated by structure, venation and genitalia.

Genus **Friscananus** Ball n. gen.

Small narrow headed species with conically pointed vertices and appressed elytra. Resembling *Colladonus* but with two or more cross-nervures between the sectors, a constricted central anteapical which is usually divided. In this character it approaches *Arundinus* De Long but that group has broader elytra with definite venation while these are irregularly reticulate and have the more conical vertices and the "strap and spoon" genitalia of *Colladonus*.

Type of the genus *Thamnotettix intricatus* Ball.

Another small western group of closely related forms approaching *Aligia* in some characters but apparently from a very different line of development.

NEW AMERICAN THYSANOPTERA

By Dudley Moulton

The present paper adds six new species of thrips to our North American fauna, five belonging to the genus *Frankliniella* Karny and one to the genus *Isochaetothrips* Moulton. A number of species belonging to this latter genus have been described from Australia and South America but the species included here is the first to be recognized from North America.

Frankliniella fulvus n. sp.

Female holotype: predominating color smoky brown including antenna, legs and wings, with antennal segments one, three, four and five lighter, the last three especially at their bases. Spines dark brown.

Total body length 1.32 mm., head length .117 mm., width .168 mm. Segments of antenna: III, 50 (20); IV, 50; V, 36; VI, 46; VII, 8; VIII, 10 microns. Length of spines: interocellar 46, postocular 30, on anterior angles of prothorax 63, on anterior margin 33, on posterior angles, outer 70, inner 83, on ninth abdominal segment, median 140, next adjoining 130, median on tenth 143 microns.

Pedicel of third antennal segment with distinct swelling in distal half. Spines on fore wings, fore vein 21, hind vein 17. Comb on eighth abdominal segment wanting.

Male allotype smaller and lighter in color, eighth abdominal segment armed as in *tritici.*

Type material: Female holotype, male allotype, 32 female and five male paratypes, taken in many wild and cultivated flowers. All types in author's collection (M. Nos. 2076, 2643).

Type locality, Fargo, North Dakota. Paratypes from Newton, New Jersey, South Dakota, Iowa, Illinois and Massachusetts.

This species may be separated from *tritici* Fitch by its brownish head, thorax, antennae and wings and by the longer prothoraic and terminal spines.

Frankliniella spinosus n. sp.

Female holotype: Color, uniformly clear yellowish including legs and wings, with thorax somewhat darker; antennal segments one to five and basal half of six clear yellow, distal half of six and style brownish yellow. All spines clear yellow.

Total body length .92 mm.; head length .09 mm., width .14 mm. Segments of antenna: length (width), I, 23; II, 33 (23); III, 46 (18); IV, 43; V, 36, VI, 46; VII, 10; VIII, 16; total 250 microns. Length of spines in microns: interocellar 48, postocular 26, on anterior angles of prothorax 53, on anterior margin 50, at posterior angles, outer 73, inner 73, on ninth abdominal segment, median 106, next adjoining 116, median on tenth 103.

Base of third antennal segment simple, all spines relatively long; spines on fore wings, fore vein 17, hind vein 13. Comb on eighth abdominal segment complete, long.

Male allotype similar in color and shape but smaller. Comb on eighth abdominal segment complete, median heavy short spines clear yellow, a smaller pair outward and posterior to these.

Type material: female holotype, male allotype, two female and one male paratypes, taken on corn May 10, 1924, by A. W. Morrill. Types in author's collection (No. 983).

Type locality: Cajeme, Mexico.

This species may be separated from *exigua* Hood by its clear yellow antennal segments one to five; in *exigua* two is brownish, and three to five are shaded distally. Also the major spines on thorax and tip of abdomen in *exigua* are brown.

Frankliniella inornatus n. sp.

Female holotype: color clear yellow including legs and wings with pterothorax and tip of abdomen shaded with dull orange. First antennal segment clear, two and six to eight brown, three yellow in basal half, light grayish brown in distal half, four and five yellowish in basal third, grayish brown in outer two-thirds. Spines brown. Ocellar crescents orange.

Total body length 1.16 mm., head length .106 mm., width .146 mm. Segments of antenna length (width), II, 33; III, 43 (20); IV, 40 (20); V, 33; VI, 46; VII, 6; VIII, 10 microns. Length of spines, interocellar 30, postocular 26, on anterior angles of prothorax 43, on anterior margin 43, on posterior angles outer 60, inner 63, on ninth abdominal segment median 73, next adjoining 76, median on tenth segment 100 microns.

Pedicel of third antennal segment simple, hind vein of fore wing with 15 spines, comb on eighth abdominal segment wanting in the middle.

Type material: female holotype and male allotype, taken in flowers of *Mangifera indica,* April 7, 1927 (L. C. Scaramuzza) (M. No. 1849). Types in author's collection.

Type locality, Baragua, Cuba.

This species is closely related to *occidentalis* Pergande but separated by the shorter and more compact antennal segments and shorter spines. It may be separated from *gilmorei* Morgan by the brown coloring of antennal segments, two to five; these are yellow in *gilmorei.*

Frankliniella andrei n. sp.

Female holotype: color blackish brown including all segments of antennae; legs dark brown with all tarsi and tips of all tibiae lighter, yellowish brown; wings pads brown.

Total body length .95 mm.; head length .093 mm., width .146 mm. Segments of antenna length (width) II, 33 (24); III, 46 (20); IV, 40; V, 36; VI, 50; VII, 10; VIII, 13 microns. Length of spines: interocellar 50, postocular 33, on anterior angles of prothorax 60, on anterior margin 53, on posterior angles 60–66, on posterior angles of ninth abdominal segment 106, median dorsal 100, on tenth segment 120 microns.

Wings reduced to pads. Comb on eighth abdominal segment complete but irregular, the setae arising from enlarged irregular bases, sometimes two or three setae from a single base.

Type material: female holotype and eight female paratypes taken from moss, November to December, 1932, 1933, at Waterville, Ottumwa and McGregor, Iowa. Named in honor of the collector, Mr. Floyd Andre. Types in author's collection (No. 5185).

Andrei is most closely related to *obscurus* Moulton but is separated by its lighter colored tarsi and tips of all tibiae, shorter spines on prothorax and by irregular and partially incomplete comb on eighth abdominal segment.

Frankliniella grandis n. sp.

Female holotype: Head and thorax yellowish brown with legs of similar color but with femora and tibiae darkened at the sides. Antennal segments two and six to eight dark brown, one and three to five lighter with four and five darkened in outer portions. Fore wings uniformly brown, spines brown. Abdomen dark brown with segments nine and ten darkened at the sides but lighter in the middle.

Total body length 1.5 mm.; head length .117 mm., width .176 mm. Segments of antenna, length (width) III, 60 (23); IV, 53; V, 40; VI, 56; VII, 10; VIII, 15 microns. Length of spines: interocellar 66, postocular 43, on anterior angles of prothorax 93, on anterior margin 90, on posterior angles outer, 93, inner 100, on ninth abdominal segment median 123, next adjoining 150, median on tenth 150 microns.

Pedicel of third antennal segment simple as in *intonsa* Trybom. Spines on fore wings, fore vein 19, hind vein 14. Comb on eighth abdominal segment complete but short. Several paratypes are uniformly light brown but with antenna and tip of abdomen dark colored as in the holotype.

Male allotype smaller and much lighter in color.

Type material: Female holotype, male allotype and seven female paratypes taken on wild sunflower, wild aster and golden rod in August, 1927 (J. C. Munro) (M. No. 2267, 2270). All types in author's collection.

Type locality, Fargo, North Dakota.

This species has the general color and appearance of *fulvus* Moulton but is easily separated by the simple pedicel of third antennal segment and the much longer spines on anterior margin of prothorax. It belongs in the *occidentalis* group but is distinguished by the longer terminal body spines.

Isochaetothrips davidsoni n. sp.

Female holotype: Color dark brown including all femora, middle and hind tibiae and antennal segments 1, 2, 6–8; with 2 somewhat lighter at the tip and 6 at the base; segments 3 and 4 clear yellow, 5 light yellowish brown; fore tibiae yellow but darkened on the sides, all tarsi yellow; wings uniformly light brown; prominent body spines brown, those on wings almost clear.

Total body length 1.1 mm.; head length .096 mm., width .13 mm.; prothorax length .153 mm., width .18 mm.; antennal segments length (width) I, 16 (25); II, 30 (23); III, 43 (20); IV, 36 (21); V, 50 (16); VI, 43 (16); VII, 10; VIII, 13 microns. Length of spines: all head spines minute, on posterior angles of prothorax, outer 40, inner 33 (?), median spines on metanotum 50, on posterior angles of ninth abdominal segment 113, median dorsal, 66, in tenth segment 100 microns.

> Sides of head straight and almost parallel. Spines on posterior angles of prothorax short, series of five on either side along posterior margin inward from angle spines with second and fourth distinctly longer. Median spines on metanotum long, placed immediately behind anterior margin and 20 microns apart. Comb on eighth abdominal segment complete but sparse, composed of about ten setae, these with enlarged bases. Tip of abdomen narrowed and pointed. Fore wings with three basal followed by 15 evenly placed spines, hind vein with 14 spines.

This is the first member of this genus to be recorded from North America and may be separated from *unicolor* Moulton, found in South America, by the clear yellow third and fourth antennal segments, these are uniformly light brown in *unicolor*.

Type material: female holotype taken August 22, 1928, (V. G. Davidson), from an unknown host. Type in author's collection (No. 3343).

Type locality: Craters of the Moon, Idaho.

A Note on the Genus Trigonurus Muls.—In checking over Dr. Van Dyke's very excellent revision, published in the Bull. Brook. Ent. Soc., Dec., 1934, p. 177, I find that we have a series of fourteen of his *Trigonorus dilaticollis*. This was described from an unique specimen taken under the bark of the coast redwood, *Sequoia sempervirens*. One of our specimens was taken at Pender Harbour, B. C., in 1928, and thirteen in 1933 at Steelhead, B. C. This would suggest a distribution from B. C. to California in the coastal region, and other hosts, as the Sequoias, are not found in B. C.—RALPH HOPPING, Vernon, B. C.

SOME UNUSUAL BUTTERFLY RECORDS TAKEN IN SCOTT COUNTY, KANSAS.

By Virgil F. Calkins, Scott City, Kansas.

For a period of about 15 days during the latter part of the month of June and the fore part of July the author took several new species and forms of butterflies not previously recorded from Kansas. A list of these species are as follows:

Papilio idaeus Fab. ♂ 6/29/35; *Leptotes theonus floridensis* Morr. ♀ 7/4/35; *Phoebis argante* Fab. ♀ 7/2/35; *Papilio thoas nealces* R. & J. ♂ ♀ 7/5/35; *Pieris monuste* L. ♂ 7/6/35; *Chiomara asychis* Cram. ♂ 7/6/35; *Anartia jatrophae* Joh. ♂ 7/11/35; *Athena petreus* Cram. ♂ (syn. *Megalura peleus* Sulz.) 8/6/35. A specimen of *Timetes chiron* Fabr. was observed July 2 feeding on Alfalfa; it escaped the edge of the net frame and was not captured.

Due to the climatic conditions prevailing at the time of capture of the above unlocal species, perhaps a bit of explanation would not seem out of place. During the period of time in which most of the above were taken, severe wind storms prevailed almost continually from the South in the Great Plains section. Scott County, Kansas, incidentally, was one of the counties in west Kansas that suffered so severely from dust earlier in the spring in the "dust-ridden" territory commonly referred to throughout the nation as the "great dust bowl."

Belated spring showers, not falling until June after the dust plague had ceased, brought out many late flowers that in normal seasons would have blossomed in May when the dust storms were at their height, and held in check the growth of all vegetation throughout the territory referred to as the "dust bowl," which comprised, largely, the entire Great Plains section of central United States.

The first capture of note was a member of the genus *Papilio*. As it was not figured by Dr. Holland in his last work, the specimen was sent to Lawrence, Kansas, for identification, and through the kindness of Mr. William D. Field who made comparisons with plates and data in SEITZ, the insect proved to represent a male specimen of *Papilio anchisiades idaeus* F. (*pandion* Fldr.,—*pandonius* Stgr.). In Seitz' work, *idaeus* F. is given as a race of the species *Papilio anchisiades*.

Dr. Holland, in the revised edition of "The Butterfly Book," mentions that a single stray specimen of *P. idaeus* Fabr. (*pandion* Felder) is in the possession of a collector at Marfa, Texas, seventy miles north of the Mexican boundary. He further says that on the strength of such a unique specimen, we might regard the species as a straggler in our southern territory, but in his opinion he evidently did not put much credence in it as it was a wind blown specimen, and, as such, was hardly entitled to be listed as a species in our boreal fauna for this reason.

Personally, I can see no good reason why a wind blown species should not be given a place in our fauna, or in check lists. There is no doubt but what many neotropical forms now listed in our boreal region from extreme southern points are only occasional to our southern boundaries, and are not known, positively, to breed within our region. There is, however, the strong possibility that such wind blown species brought northward on the brunt of a high wind could find identical, or similar, food plants upon which to exist and should climate and other factors be in their favor, could they not eventually become domiciled? The common Monarch, *Danais plexippus* L., for example, cannot survive the rigors of winter in our northern climate, but it comes northward to us in spring and finds suitable vegetation upon which to lay eggs for one or more broods before cold weather kills off the existing adults or they are forced to migrate southward to warmer climes. Perhaps some of the stray neotropical forms now included in our nearctic, or boreal, list may only occur in one or two summer broods, the advent of cold weather making it impossible for the development of more. If, in order to include a species in our fauna, it should first be proved to breed within our region, as Dr. Holland's opinion seemingly would indicate, I believe that many of our extreme southern forms would have to be questioned as the earlier stages of some of them are not, as yet, fully known.

The effect of wind on the occurrence of Lepidoptera is a subject not fully appreciated—especially as it concerns the species and forms to be found at various times in the Great Plains Region, and it should be more generally studied elsewhere for what bearing it might have in regard to general distribution records in other regions.

The following species and forms previously recorded from Scott County perhaps owe their occurrence to the force of the wind: *Papilio daunus* Bdv.; *Papilio brucei* Edw.; *Papilio hollandi* Edw.; *Ascia amaryllis josepha* G. & S.; *Phoebis philea* Joh.; *Aphrissa statira jada butleri* Scud.; *Anteos clorinde* Godt.; *Kricogonia lyside* Godt.; *Heliconius charithonius* L.; *Phyciodes vesta* Edw.; *Anthanassa texana seminole* Skin.; *Chlosyne lacinia adjutrix* Scud.;

Mestra amymone Men.; *Victorina steneles* L.; *Anaea morrisoni* Holl.; *Grais stigmaticus* Mab.; *Copaeodes aurantiaca* Hew.; *Amblyscirtes nysa* Edw.; *Thanaos funeralis* Scud. & Burg.; and *Lerodea eufala* Edw.

Of these species, only badly tattered stray specimens have been taken with the exception of *A. statira jada butleri, K. lyside, P. vesta, A. texana seminole, A. nysa, T. funeralis,* and *Ler. eufala,* of which from 1 to 6 specimens each have been taken the past two or three years, some of them in excellent condition, which would seem to indicate that some of them may not be wind blown entirely.

A NEW ECITOPHILOUS NORTH AMERICAN PHORID FLY.

By Charles T. Brues, Biological Laboratories,
Harvard University

In the American Naturalist for May 1902[1] the present writer published an account of a very remarkable subapterous phorid fly from nests of *Eciton opacithorax* near Austin, Texas. This was described as *Xanionotum hystrix,* and formed the type of a new genus, of which the male was at that time unknown. For many years no further species of this genus were discovered, until in 1923 when Borgmeier[2] described a Brazilian phorid as *Schmitzia* (type, *S. spiniceps*) which has been considered a synonym of *Xanionotum* by both Borgmeier and Schmitz. Further, in 1924 Borgmeier added *Ecitocantha* which has likewise been suppressed as another synonym of *Xanionotum.* In a review of the genus published in 1932[3] Borgmeier includes ten species of *Xanionotum,* all from Brazil and Mexico, except the single Texan form.

Recently I was very much surprised to receive from Professor M. R. Smith of the Mississippi State College two specimens of a species of *Xanionotum* which he collected last spring with *Eciton schmitti* in Mississippi. These appear to represent an undescribed species, most closely related to the Brazilian *X. wasmanni* Schmitz and the Texan *X. hystrix* Brues. It is a great pleasure to be able to name this new species in honor of its discoverer who has done much to further a knowledge of the ant-fauna of his home state.

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[1] Vol. 36, p. 376.

[2] Zeits. Deutscher Ver. Wiss. u. Kunst, São Paulo, Jahrg. 3, p. 168.

[3] Revista Entom., vol. 2, pp. 369–380.

Xanionotum smithii sp. nov.

♀. Length, in well expanded condition, 1.7 mm. Thorax, head and legs pale brownish yellow. The front black, except for a yellow median stripe that is widened above to include the middle pair of ocellar bristles, each of which is set in a black spot. Abdomen whitish, the small second tergite dark; abdominal bristles and the basal series of comb-like bristles from which they arise, black. Front with four long, practically equal postantennal bristles, each almost as long as the height of the front, the upper pair not much farther apart than the lower pair; antial bristles at the level of the upper postantennals, three times as far from them as from the lowest lateral bristle, directed strongly inwards and upwards. Preocellar bristles apparently represented by only the lateral one on each side which is just above and inside the upper angle of the eye; four large ocellar bristles, the lateral ones near to, but above and median to the lateral preocellar bristle. There are thus ten frontal bristles in addition to the postantennals. Eyes small, oval, about two-thirds as long as the third antennal joint. Antennae broadly ovate, with a stout, shortly pubescent arista. Palpi narrow and rather long, bristly on the underside of their apical half, the bristles strong, about as long as the width of the antenna. Labella of proboscis forming a conspicuous, flattened, pyriform, acutely pointed plate with a deep dorsal median excavation. Cheeks each with a single stout, downwardly directed bristle. Mesonotum with two long, stout dorsocentral bristles; humeri each with a strong laterally extended bristle; propleura with a small one near the base of the coxa. Wing vestiges with a short, slender erect bristle at base above and with about ten long, upwardly and backwardly curved bristles, each nearly twice as long as the wing. Legs quite stout, the tarsi all noticeably thickened; basal joint of front tarsi one-half as long as, and nearly as thick as the tibia; middle and hind tibiae each with a single stout anterodorsal bristle very close to the base and more or less distinctly fringed with minute bristles on each side of a dorsal glabrous strip, this latter more clearly marked on the middle than on the hind tibiae; first joint of hind tarsi with about ten transverse combs of very minute bristles. Abdomen membranous, except for the small plate of the second segment; this is triangular, with the base broadly and deeply notched and is about as large as the third antennal joint. Four rows of enormous bristles on the dorsal side of the abdomen as in *X. hystrix* Brues and *X. wasmanni* Schmitz, their attachments forming transverse comblike plates as figured by Schmitz for the latter species. Bristles of basal rows longer, most of those in all rows extending about to the apex of the abdomen when the latter is moderately distended; first row with about 38–40 bristles, second with about 52–54; third and fourth with nearly as many as the second. Behind these is a row of much shorter bristles arising directly from the membrane; terminal segments and appendages sparsely, minutely bristly.

Type and one female paratype from State College, Mississippi, May 31, 1935, taken from a trail of legionary ants, *Eciton schmitti* Emery, "moving rather briskly along with the column of ants" (M. R. Smith).

This species agrees with *X. hystrix* Brues and *X. wasmanni* Schmitz in possessing only one pair of dorsocentral bristles and in the very numerous abdominal bristles. These are much more closely placed than in *X. hystrix,* but not so numerous as in *X. wasmanni.* The middle and hind tibiae each bear a strong bristle at the base as in *wasmanni.* I have reexamined my two specimens of *hystrix,* but can find no trace of a bristle at the base of the tibiae. Nevertheless, it seems that these must have been broken off, although in both specimens of the new species, also preserved in alcohol, they are present on all four tibiae. This point can be determined definitely only after further Texan material has been examined. The close similarity of the three species, however, makes it seem improbable that the tibial chaetotaxy should differ so greatly among them.

X. hystrix, X. wasmanni and *X. smithii* differ considerably from the other members of the genus in appearance as the enormous bristles which form four rows across the back of the abdomen are so densely placed that the flies resemble microscopic hedgehogs. In the other species the bristles are extremely long, but not numerous and the flies are much less extraordinary in appearance.

THE FOOD PLANTS OF THE LEAFHOPPERS OF THE GENUS EXITIANUS.

By E. D. Ball, University of Arizona, Tucson, Arizona.

This genus was founded by the writer to include a single widely distributed species *E. obscurinervis* Stål. The author's later collections and food plant studies indicate that there are four distinct species of this genus occurring in Arizona, which can be separated by the following key:

A. Ovipositor definitely exserted extending much beyond the spines on the pygofers.
B. Ovipositor rarely as long as the elytra. Species rather slender, gray . . . . 1. *obscurinervis* Stål
BB. Ovipositor extremely long, usually longer than the elytra. Species broad, heavily black marked, the males often nearly black . . . . 2. *picatus* Gibson
AA. Ovipositor not extending beyond the spines on the pygofers.
C. Pale cinereous, the face yellow, the elytra unmarked except for the brown nervures, a pair of black spots on vertex and another pair on the lateral margins of the pronotum. 3. *armus* Ball
CC. Heavily and somewhat irregularly marked with rich brown above and below, the cross nervures brown margined. 4. **kinoanus** Ball

E. obscurinervis Stål. Osborn has shown that this widely distributed species feeds on Bermuda Grass and spreads from there to other vegetation.

E. picatus Gibson (*miniaturatus* Gibson) has been found almost exclusively on a "five finger" or Crab grass (*Digitaria sanguinalis*), in damp and shaded situations. This species occurs in Hayti, Guatemala, Mexico, and as far north as southern Arizona.

E. armus Ball. This strikingly marked species feeds on the evergreen desert hackberry (*Celtis pallida*) in Southern Arizona and Northern Sonora, Mexico.

Exitianus kinoanus Ball n. sp.

Smaller and narrower than in *armus* with irregular dark brown markings including a pair of large crescents on the basal areas of vertex. Length female 4 mm.; width 1.1 mm.

Vertex scarcely twice wider than long, rounding over to front with a very slight median production. Front wider below than in *armus*. The elytra narrower than in *armus* with the inner claval veins shorter, but much longer than in *obscurinervis*. The subcosta thickened and corrugated towards the apex. Female segment nearly truncate posteriorly with the median fourth definitely triangularly produced. Male plates broader at the base than in *armus,* then roundingly narrowing into long, attenuate, slightly divergent, apices.

Color rusty straw marked with brown, the vertex lighter with a cloud on the margin, a crescent extending from the ocelli back over the disc, emphasized in two pairs of spots. A pair of large round spots on the posterior disc usually emarginate behind. Pronotum irregularly marked with brown the anterior margin lighter with about 6 round spots. Scutellum pale, a pair of round dots on disc, and the larger, subangular areas brown. Elytra, milky subhyaline with brown nervures. The cross nervures and angles broadly marked or clouded. Face dark lined in the female, all dark in the male. The darkest examples have the disc of the elytra, smoky with two or three rows of milky dots.

Holotype female, allotype male, and a pair of paratypes, Gillespie Dam. Apr. 13, '33; four paratypes, Tucson; one Roosevelt Dam; one Baboquivari Mts.; two Bisbee; all in Arizona, and two Kino Bay, Sonora, Mex.; all taken from mesquite by the writer.

A. N. Caudell.—As we go to press, we learn of the death on March 1st of Mr. A. N. Caudell, Curator of Orthoptera in the United States National Museum.—G. P. E.

ON THE OLFACTORY POWERS OF A NECROPHILOUS BEETLE.

By Cyril E. Abbott, Morgan Park, Ill.

Creophilus villosus Grav. furnishes almost ideal material for experimental work on olfaction. The beetles can be easily handled in small cages, and live for months in captivity, even breeding under such conditions.

Materials and Methods

An experimental cage was made from a wooden box with internal dimensions of 18″ × 11½″ × 10½″. Two partitions divided this into three chambers, each having a separate cover consisting of a wooden frame covered with wire screen. Each partition was perforated by three openings 1″ in diameter, at the respective distances of 2″, 4″, and 6″ from the end of the chamber; each set being placed at the opposite end of the central chamber from the other. The openings were 6½″ from the floor of the cage, which was filled with sand to this depth in all chambers. Each end chamber contained a glass jar 5½″ high and 2½″ internal diameter, buried in the sand to its rim, and containing, one a damp cloth, the other about 1 oz. of decaying meat. Each jar was covered with paper, cross-cut nearly to the rim of the jar, but covered with enough sand to make it nearly invisible.

Experiments were conducted on two successive years (1934–35) during the month of May. Specimens taken in the morning were allowed to remain in the collecting jar until afternoon. They were removed singly; the antennae were "plucked" from every alternate specimen, and the wounds covered with shellac. (In a few cases, to be mentioned hereafter, the antennae were simply covered with shellac). Both normal and amputated specimens were counted, and a record kept of the number of each. In this way equal numbers of normal and of amputated specimens were obtained; extra specimens were held over for the following test.

Both normal and treated specimens were then placed in the central chamber of the experimental cage, the outlets to which had previously been closed with cork stoppers. About two hours later these plugs were removed.

Twenty-four hours later the plugs were replaced, any specimens running free in the end chambers were returned to the middle section, and the trap jars were removed. A record was then made of both amputated and normal specimens in each of the trap jars.

These specimens were then discarded. At the end of four days, after collecting the usual data, the sand was removed from all of the chambers, thoroughly mixed, and returned to the box, which, in the meantime, had been cleansed with warm water. The position of the trap jars was then reversed. Experiments then proceeded as before.

In 1935 certain specimens, instead of having the antennae removed, were treated by covering those organs with shellac. Since, however, it was necessary, in order to prevent the insects from removing the material, to amputate the anterior legs, it is unlikely that this method was more reliable than the other. For purposes of comparison, however, all results are given.

Besides the record of the number of beetles introduced into the cage, and the number taken from the traps, an attempt was made to account for those found in the sand of the end chambers. But this data probably had no value except to indicate the number of beetles that did not respond to the traps.

RESULTS

The results for amputated and for normal specimens were as follows:

	Test jar		Control jar	
	No. specimens	%	No. specimens	%
Normal	125	51.25	116	47.56
Amputated ...	51	37.74	83	61.41

The shellacked specimens gave the following results:

Test jar		Control jar	
No. specimens	%	No. specimens	%
0	0	25	100

(The significance of the peculiar results of shellacked specimens will be given in a later paper.)

INTERPRETATION

Disregarding the shellacked specimens, which behaved rather abnormally, there was a difference of 13.15% in favor of the normal specimens regarding the extent to which they were attracted to decaying animal matter. The difference in total response between normal and amputated specimens for the control trap amounted to 13.90% in favor of the normal specimens. The difference in responsiveness toward both traps between normal and amputated specimens was 62.66% in favor of the normal specimens.

Thus the amputation of antennae appeared to decrease the responsiveness of the beetles by nearly half. It is this reduction of activity which, in some cases, has doubtless been interpreted as a reduction of olfactory powers. On the other hand, this amputation does not otherwise affect the behavior of the beetles, since several amputated specimens were not only kept alive without difficulty four weeks, but also copulated and deposited fertile eggs. The large number of beetles taken in the control trap indicates that the Creophili are attracted somewhat by moisture.

CONCLUSIONS

1. Experiment indicates that the antennae of *Creophilus villosus* Grav. are not exclusively olfactory in function.
2. Amputation of the antennae decreases the activity of this species almost by half.
3. The Creophili are attracted to some extent by moisture.

"In your literature, you said there was a nip in the air after sundown," complained the summer boarder. Whereupon the proprietor of the hotel snickered, "Well, it's the truth, ain't it? Look at them mosquitoes."—*Newspaper.*

BOOK NOTES.

An Abridged Catalogue of Certain Scutelleroidea (Plataspidae, Scutelleridae and Pentatomidae) of China, Chosen, Indo-China and Taiwan, by William E. Hoffmann, Lignan University Science Bulletin, no. 7; pp. i–iv + 1–294 (Issued August 21, 1935). (Published by Lignan University, Canton, China. Price, $1.50 Mexican.)

This is essentially a contribution to zoogeography limited to a definite and restricted group of insects—certain of the Families of the Scutelleroidea. Its interest, naturally, is for two groups of students—hemipterists interested in geographic distribution and zoogeographers *per se*. But likewise, since geographic distribution is one of the keys to the mystery of the origin of species, this work is of value to the students of evolution. It is not possible within our brief limits to do more than very roughly sketch its contents.

We quote from the Introduction, which summarizes the whole work, a few pertinent citations which explain it as the author sees is, and as this reviewer sees it also. "Although the present work supplements Kirkaldy's Catalogue, its value is by no means limited to use in that connection. This bulletin may be of use to specialists, and also to individuals outside of the territory covered. . . ."

"As may be seen by reference to the Table of Contents, this bulletin contains (besides the introduction and systematic catalogue) the following divisions: a discussion (with table of statistics) of the relation between Kirkaldy's Catalogue and the present bulletin; an alphabetical list of genera and species (wherein the forms not included in Kirkaldy's Catalogue are marked by asterisks) ; the annotated bibliography of 540 titles; and appendix concerning faunal subregions and the classification of political areas and localities (with a table indicating the numerical distribution of the species and varieties catalogued herein, in the various countries and provinces noted in the title of this bulletin) ; a second appendix listing about 600 miscellaneous place-names, their locations and their respective faunal subregions; and an index to genera and species (both those accepted in this bulletin and those synonymized or otherwise not accepted)."

This is really a very worthy faunistic study; nothing like it has been published in any language on the Heteropterous fauna of the vastness which is China. Indeed, Dr. Hoffmann is to be congratulated on having produced a fundamental work. And in spite of many handicaps, the whole work is remarkably free from typographical errors; as to erroneous citations, the lack of adequate libraries has caused some few, but not many more than have been perpetrated in places where vast accumulations of works were at hand.

The price named, $1.50 Mexican, translated into U. S. means less than 75 cents.

J. R. T.-B.

A Contribution to a Bibliography of the Described Immature Stages of North American Coleoptera, by J. S. Wade; pp. 1–113. (Mimeographed; dated September, 1935.)

To any coleopterists whose interests lie in the biology and higher systematics of the Coleoptera, this will be found an invaluable reference book. The vast literature in all Orders is so scattered and its various phases so inchoate, that such works as Dr. Wade's are labor-savers of the first degree. The presentation of the species is purely alphabetical, according to genera; there is no attempt at any systematic arrangement under any of the higher groupings; which renders the work very readily usable. In fact, it is a true index to genera and species in regard to immature stages. Dr. Wade points out that there seems to be no other work of a similar nature published since Wm. Beutenmuller's 1891 paper—a stretch of 44 years! It seems incredible that in an Order so intensively studied, so little attention should have been given to one of the necessary aspects of research into its biology. After all, it *is* necessary to know what has been done and where, as a guide to what needs to be done or to what is still undone.

In these days of high printing costs and of scanty funds for those things which the "practical" man deems visionary, or, at best, useless, it has been necessary to reproduce the job on the mimeograph. It does not appear anywhere in it who the modest publishers are; nor how much it costs; nor where it may be secured and how. Obviously, to get it, one should address Dr. J. S. Wade, Bureau of Entomology, at Washington.

J. R. T.–B.

EDITORIAL.

NATIONALISTIC SCIENCE

It *is* a truism to consider science to transcend all limitations. If it be in any way not universal and for all, in that measure it ceases to be scientific. Science is independent of religion, politics, race, nationality, social system. It must be a free, untrammeled, uncontrolled approach to an objective solution of the secrets of the universe, unbiased by any preconceptions, else the Well of Truth is poisoned at its source. In science, all are elect—the prince and the scullion, the believer and the atheist, the financier and the pauper. No one is greater than any other. Each stands only on his accomplishment. But since the last unlamented war, all is changed! The fierce nationalism that taints all world thought is crawling into the pure temple of austere Science undefiled. Are we going into European science and American science, with an eternal division of rightness and wrongness between the two, as broad as the ocean that divides them? Are we to have English, American, Russian, Japanese, French, German Science, each alone right and any others wrong?

Time was when there was some approach to a universal language of science in Latin; then German, French and English became acceptable. Then the debacle. Now, with self-assertive nationalism upon us, one must endeavor to cope not only with the Sanskrit derivatives, but also with the Turanian tongues, even unto their minutest ramifications.

And all these considerations depend upon the vast mass of entomological writing now going on in *all* European languages and in the, to us, more alien Asiatic. Who can hope to know what is being done, when the facts and conclusions are hidden in Russian, Polish, Czecho-Slovak, Hungarian, Egyptian, Turkish, Japanese, Chinese?

A case to point the argument: An extensive work has been published in Russian, on the flies of European Russia—nearly 800 pages, dealing with 60 genera and *3,000* species of non-nematocerous Diptera. What new light this may contain, what changes it may make in this vast assemblage, are to us of America and Western Europe as if they were not!

This is a nationalistic and class science at its worst, even though it be urged that it was done to give the unlearned an opportunity at the treasures of Science.

I offer no remedy. There is none, in this atmosphere of hatreds.

P. S.—A recent number of *Science* carries an advertisement of certain scientific works, to show Soviet science to the world. It is thus categorically stated in the advertisement! J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of October 10, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 10, 1935. The meeting was called to order at 8:00 p. m. with President Davis in the chair and seven other members present, namely Messrs Engelhardt, Nicolay, Ragot, Rau, Shoemaker, Siepmann and Willford; also Messrs. Adelman, Crowe, Fisco, Friedland, Heitzmann and Stecher, Mrs. Nicolay and Mrs. Shoemaker and a reporter from the *Brooklyn Daily Eagle*.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the usual report of the Treasurer, which was ordered placed on file; he also read a letter from Mr. Torre-Bueno.

Mr. Davis read the text of a new "Articles of Incorporation" which had been drawn up, and read excerpts from the old charter where changes were made. The society had originally been incorporated in 1885 for a period of fifty years, so that its present charter expires this year. The new Articles of Incorporation had been signed by Messrs. Leng, Davis, Engelhardt, Shoemaker and Siepmann, Mr. Leng having been a signer of the original charter granted fifty years ago.

A motion was made and seconded that the Society be re-incorporated; and that the new Charter Mr. Davis had read be adopted; which motion was unanimously carried.

Mr. Engelhardt reported that a species of Loblolly Bay in the Brooklyn Botanical Garden had been completely defoliated by *Cecropia* caterpillars during the past season, while other shrubs nearby were not attacked. There are several species of Loblolly Bay native to the southern states. The one cultivated in the Brooklyn Botanical Garden has been called *Gordonia alatamaha,* named for the river of that name in Georgia where it was discovered by John Bartram in 1765 growing in swampy regions as trees and shrubs. At present this Gordonia is reported as being no longer found in its original native haunts in Georgia, the only surviving examples being cultivated descendants, one, a large old tree in the Bartram Garden, neighboring Benjamin Franklin's estate in Philadelphia and others of smaller growth in Botanical gardens, including that in Brooklyn. Some of the cultivated specimens from the north were returned and carefully planted in their native soil but they failed to grow. Mr. Engelhardt also exhibited a series of specimens of *Enodia portlandia* Hbn. from Hartsdale, New York, and one specimen of the same species from Millinocket, Maine. He also presented a short paper on "Entomological Observations at Hartsdale, Westchester County, New York," which will be published separately in the Bulletin.

Mr. Wilford reported that he had caught about a dozen specimens of *Thecla liparops* at Hewitt, N. J., and that he considered this number pretty good. Mr. Crow exhibited three boxes of Coleoptera and Lepidoptera, and Mr. Fisco showed some Coleoptera.

Mr. Shoemaker said that he obtained 17 species of *Catocala* in the Bronx Woods during the past season, though they were scarce compared with last year. On the other hand, he never saw Cecropias so common in Brooklyn as this year. On digging up the iris in his garden, he found them infested with a borer, which he bred, obtaining an excellent series of the iris rootborer, *Macronoctua onusta.*

Mr. Nicolay said that he had been collecting at Mr. Desert Island, Maine, and that he obtained the Carabid Beetle, *Nomaretus bilobus* in bottles at sea-level. Both Mr. Nicolay and Mr. Wilford commented upon the discontinuance of railroad service to Greenwood Lake, and regretted that this popular collecting ground could no longer be reached by collectors who could not go there by car.

Mr. Rau exhibited several species of scale insects, two of them, *Chionaspis elongatus* Green and *Aspidiotus secretus* Green, being new to the United States. Both occur on bamboo in the New York Botanical Garden. He also obtained *Cerataphis lataniae* Boisd. from the same locality, which species is not recorded in the 1921 survey of scale insects in the New York Botanical Garden. He said that *Pseudococcus comstocki,* occurring on the umbrella catalpa, was quite a pest locally. Mr. Rau also spoke briefly upon the different methods of control employed against scale insects. In Florida diseases are effective, while in California parasites have been found more useful, due to the difference in humidity.

Mr. Davis exhibited six new cicadas from the Western United States which he has described in the September number of the Journal of the New York Entomological Society. He commented upon the difficulty sometimes encountered in separating the different species, and said that it was a great advantage to have large series. With only two or three specimens it is hard to tell where you are at, but with a large series the species can be separated pretty well.

Mr. Hans Stecher spoke of his experience with Black Widow spiders, saying that it was difficult to induce the spiders to bite when handling them. Mr. Rau added that the California Department of Agriculture has recently published a 20-page bulletin on the Black Widow. Mr. Ragot said that he had been in Julian, North Carolina, during the middle of August; that the weather was dry, collecting poor, and the Black Widow common.

Adjourned at 10:00 p. m.

Carl Geo. Siepmann,
Secretary.

Vol. XXXI JUNE, 1936 No. 3

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OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

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JUL 6 1936
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PUBLICATION COMMITTEE
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CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

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SWIMMING PLUME AND CLAWS OF THE BROAD-SHOULDERED WATER-STRIDER RHAGOVELIA FLAVICINTA BUENO (HEMIPTERA).

R. E. COKER, VERA MILLSAPS AND RUBY RICE
University of North Carolina

One of the most notable of specialized animal structures, and one that has received comparatively little attention, is found in broad-shouldered water-striders of the genus Rhagovelia, which possess in a cleft of the terminal segment of the middle tarsus an elaborate "swimming plume" accompanied by long flat bladelike chitinous structures regarded as modified claws. We have found no description of the claws other than the brief characterization by Mayr (1865): *unguiculi 2 longissimi parum curvati";* nor have we encountered a description or figure of the swimming plume corresponding in detail to what we see in examples of Rhagovelia of the region of Chapel Hill, N. C. Only de la Torre-Bueno (1907) seems to have given attention to the mode of employment of the plumes by the insect as it runs on the water. He gives good figures of the swimming plume when closed and when spread for action, but the claws are not shown and in none of his figures does the plume appear in such a position as to reveal the mode of connection of the hairs. Gould (1931 and 1934) does not describe the claws but shows them in his figures for *Rhagovelia obesa* (1931, Pl. 5, fig. 10); here again, the arrangement of the hairs in the plume is not definitely brought out, or, at least, it is not clearly such as we find in our examples.

A more detailed description and illustrations of these remarkably specialized structures seem, therefore, to be desirable.

Dr. Gould has kindly identified specimens sent him as *R. flavicinta* Bueno while suggesting the possibility that *flavicincta* is a synonym of *obesa* Uhler (our original identification). We wish to

JUL 3 1936

thank Mr. de la Torre-Bueno and Drs. Hungerford, and Gould for helpful comments regarding the claws of Rhagovelia in general.

The middle tarsus consists of three joints, a very short inner one, a longer middle one, and a distal one cleft more than two-thirds of the way to its base (fig. 1, *e*). The swimming plume and claws are attached in the bottom of the cleft. When not in use, the plume appears as a mere tuft of hairs protruding from the side of the cleft; when, however, it is extended in fanlike fashion, as shown in figure 1, *d* and *f*, it presents a very different appearance. The 17–20 plumose hairs are not a simple cluster arising from a common point, but they branch off one by one from the basal half of a common stem, which, through the greater part of its length, is not essentially different from one of the other hairs, fig. 1, *f* and *g*). Actually, the plan of the plume is a little more complex than might be inferred from the statement just made. The stem is attached to the limb between and below the modified claws. Beyond a short, thick, conical, sharply curved and unbranched base (fig. 1, *g*) it divides into two branches, one of which, bent sharply upward, bears only 3 or 4 hairs, the other, curving downward and outward, bears 12 to 16 or more hairs. A short, sharp, recurved spine on the distal curvature of the base and a longer and stouter spine, arising from the limb near the base and extending parallel to the claws, seem to be characteristic features. Along with the fan of feathery hairs, which Gould regards as a modified pulvillus, are two bladelike structures, the modified claws. When the plume is extended, these blades, one on each side of the cleft, may not be visible at all, but, when the hairs are spread, as we have observed them, one blade extends outward alongside the fan, and almost at right angles to the axis of the tarsus, while the other remains largely concealed within the cleft, except for a narrow margin showing just without the cleft and on the opposite side from the fan of hairs. Presumably this latter claw must at times be extended further outward, but we have never seen it so and have often had difficulty in detecting its presence at all, even when all other tarsal appurtenances were conspicuously displayed. The first mentioned platelike claw (fig. 1, *h*, right) is broad at the base, but tapers roughly to a blunt point. Its margin is slightly concave on one side and convex and variously notched on the other, which, in the extended position, is turned toward the tip of the tarsus. The other blade is also slightly curved, less tapering and generally, but not always, deeply notched at the tip (fig. 1, *h*, left); it is more variable in form than is the pointed claw.

The blades are brownish amber in color, and each has, running from the base to the tip, a darker or lighter median strip of stippled or mottled appearance, bounded by dark lines and representing the cavity of the claw. The claws are so very brittle that it is difficult to remove them without breaking them.

The use of the swimming plume is well described by de la Torre-Bueno (1907), who found that when the insect was running on the water, the middle tarsus was actually thrust through the surface film so that the plume of hairs was employed as a paddle; thus the water strider of this genus does in fact swim in the water and run on the surface at the same time. The possible use of the claws in locomotion remains to be studied, but it may not be without significance that they are obviously paddle-like in form, and that the position of at least one of them is usually such as to afford support for the plume.

The habitat of the bugs is swift water, or the eddies alongside, where the current must frequently be contended with. Gould (1933) says that, with the exception of two species of marine habit, all members of the genus live upon the ripples or rapids in small streams of running water, where they await food brought them by the current.

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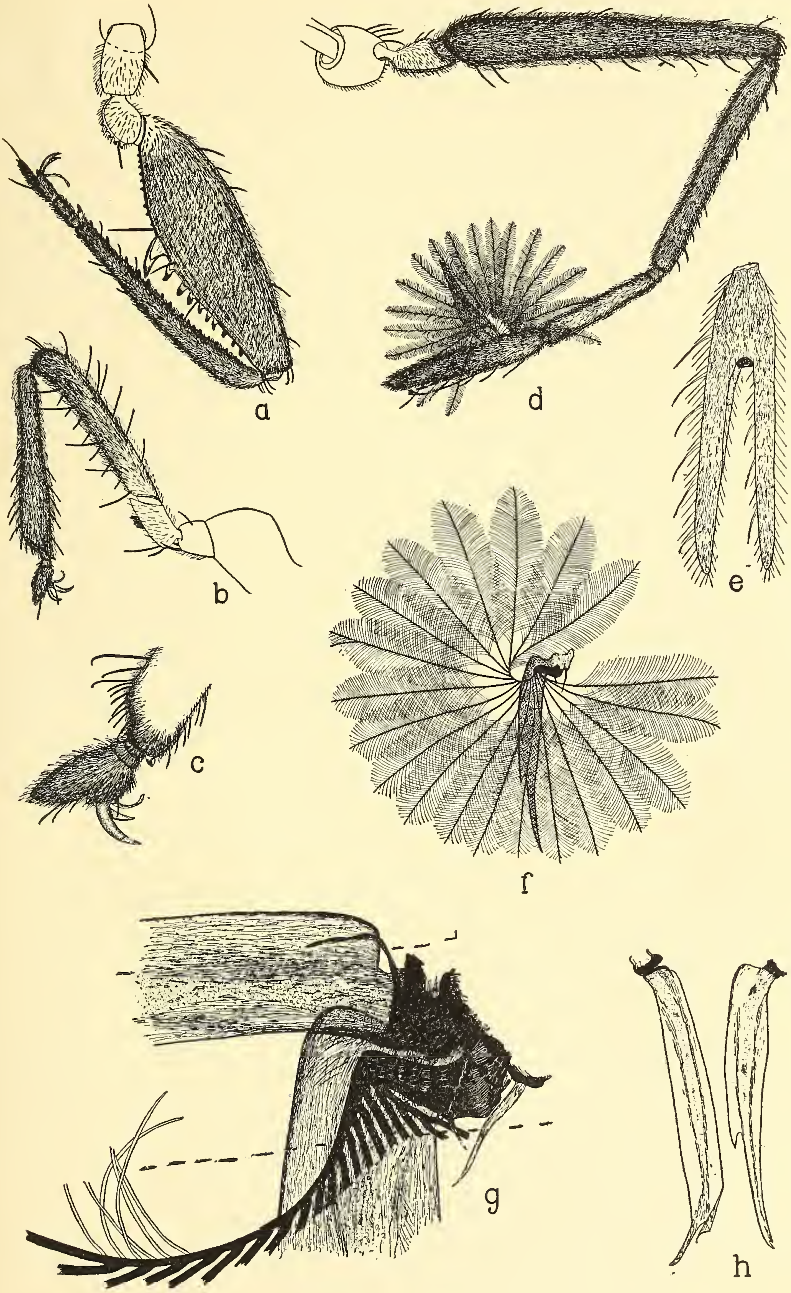
EXPLANATION OF PLATE IV.

FIG. 1. *Rhagovelia flavicinta* Bueno

- a. Hind legs of male, showing claws and pulvillus. (× 27)
- b. First leg, showing claws and pulvillus. (× 27)
- c. Tarsus and lower end of tibia of first leg, more enlarged. (× 54)
- d. Middle leg showing swimming plume (pulvillus) and claws; one claw mostly concealed in notch of distal segment. (× 27)
- e. Deeply notched distal segment of tarsus of middle leg, from which claws and swimming plume have been removed.
- f. Swimming plume and one of the claws, more enlarged.
- g. Base of swimming plume and claws. (× 220)
- h. The two claws of middle tarsus. (× 54)

PLATE IV



NOTES ON NEMOTELUS (DIPT., STRATIOMYIDAE).

By Maurice T. James, Colorado College, Fort Collins, Colo.

The genus *Nemotelus* has been divided by certain European authors into the two subgenera *Nemotelus* s.s. and *Nematotelus* O.S., the latter being distinguished by the unicolorous abdomen and the lack of vein R_4. When applied to our species, this combination fails to hold, though there is a strong correlation between the bicolored or white (male) abdomen and the presence of vein R_4. Moreover, the presence of this vein does seem to be a significant character. I am therefore maintaining this subgeneric terminology in this paper, at least as a useful concept. The final value of such a division must depend on further research.

This genus is badly in need of monographic treatment, especially in regard to those species referred to *Nematotelus*. A study of the male genitalia would no doubt be valuable here. It is the purpose of this paper to describe three species that seem to be unquestionably distinct, and to key the species referable to *Nemotelus* s.s.

Nemotelus (Nematotelus) albimarginatus, n. sp.

Related to *N. arator* Mel., but readily distinguished by the white abdominal markings. The greater length of the facial prominence, the more robust form, and the difference in abdominal patterns will readily distinguish it from *N. lambda* James, the only other species with which it might be confused.

Male. Shining black, with creamy-white markings. Facial prominence of moderate length, its apex distant from the eyes by about the length of the antennae; eyes almost contiguous. Antennae black; the terminal segment (6th) of the flagellum much shorter than the fourth. Thorax with conspicuous white pile; humeri, the broad pleural margins, and the supra-alar calli conspicuously creamy-white; knob of halteres white. Abdomen white-pilose, the pile slightly less dense than on the thorax; black, its broad lateral margin, both dorsally and ventrally, except on the first segment, the apices of segment five dorsally and of three, four, and five ventrally, and all of segment six, creamy-white; genitalia yellow. Coxae, trochanters, femora except the apical third, and a median annulus on the hind tibiae, black; legs otherwise yellow. Wings hyaline; strong veins yellow, the others barely discernible from the membrane; R_4 absent. Length, 5 mm.

Holotype: male, Kingston, Utah, June 19, 1935 (C. J. Sorenson). Utah State College Collection.

Paratypes, 4 males, same data; male, Yakima, Wash., July 8, 1935 (E. I. Beamer).

Nemotelus (Nematotelus) fulvicornis, new name

N. flavicornis James, Amer. Mus., Nov. 571: 7, 1932 (nec. Johnson).

Through some error, this species was published as *flavicornis,* whereas *fulvicornis* was intended. Because of the preoccupation of the published name, the correction must be made.

Nemotelus (*Nematotelus*) *lambda* James

James, Jour. Kans. Ent. Soc., 6: 70–71, 1933. The female is here described for the first time.

> Female: A handsome little species. General ground color black; a pair of prominent ivory-colored spots on the front, just above the base of the antennae; these spots are almost confluent on the median line; the posterior ocular orbits also prominently ivory-colored on the lower half, black on the upper; genae black. Facial prominence very short. Proboscis short, straight. Thorax black; humeri and the margins of the pleura, from the humeri to the wing bases, white. Scutellum black. Pleura and pectus with a somewhat brownish tinge. Halteres white. Abdomen black, bordered laterally and apically by a narrow but very definite white margin; venter black with a somewhat brownish cast, and bordered laterally and apically with white; segment two bordered with white basally, this border widened medially; segments three and four with narrow white apices. Femora black, their apices whitish; tibiae yellow, their bases whitish; the hind tibiae darkened to almost black; tarsi whitish. Wings clear hyaline, the veins whitish. L., 4.5 mm.

Allotype: female, Jemez Springs Mts., N. M., May. Purdue University Collection.

KEY TO NEMOTELUS S.S.

1. Vein R_4 absent .... subgenus *Nematotelus*
   Vein R_4 present (subgenus *Nemotelus*) 2
2. Lower section of proboscis shorter than the head, more or less thickened, either straight or upturned 3

Lower section of proboscis at least as long as the head, slender, rigid, and arcuate; labellae inconspicuous; abdomen, in both sexes, marked with white or yellow 6

3. Lower section of proboscis almost the length of the head; labellae not especially well-developed 4

Lower section of proboscis not more than half the length of the head; labellae fleshy 5

4. Humeri entirely white; tibiae entirely pale; comparatively slender species; abdomen of female red, marked with white . . . . *rufoabdominalis* Cole

Humeri each with a small yellow spot; tibiae largely black; more robust species; abdomen of female black, marked with white . . . . **montanus,** n. sp.

5. Abdomen, in both sexes, entirely black . . . . *bruesii* Mel.

Abdomen of male largely white, that of female marked with white . . . . *bonnarius* Johns.

6. Antennae exceptionally long; the second segment twice as long as wide, and the style usually erect . . *quadrinotatus* Johns.

Antennae of normal length; the second segment about as long as wide; style usually forming an angle with the rest of the flagellum 7

7. Humeri, and usually an area around them, white 8

Each humerus at most with a small white or yellow spot . . 10

8. Female with either a broad apical pale band or with paired triangles on segments 2, 3, and 4; eastern species; length, 4 mm. or less 9

Female with a single apical pale triangle each on segments 2, 3, and 4; western species; length, about 5 mm.
knowltoni, n. sp.

9. Facial prominence extending beyond base of antennae two-thirds their length; pale abdominal bands of female not divided . . . . *abdominalis* Adams

Facial prominence extending to no more than the middle of the antennae; pale abdominal bands of female each divided into two triangles . . . . *bellulus* Mel.

10. Legs wholly yellow . . . . *immaculatus* Johns.

At least the femora largely black 11

11. Facial prominence black; abdomen of female black, with a median row of white apical triangles on segments 2, 3, and 4 12

Facial prominence white above; abdomen of female brown, with paired yellow apical triangles on segments 2, 3, and 4 . . . . *albirostris* Macq.

12. Tibiae usually black; basal half of abdominal segment 5, in male, black; female with the white triangle on segment 4 usually not expanded laterally .... *kansensis* Adams
Tibiae usually pale; abdomen of male immaculate; the white apical triangle of segment 4 usually expanded laterally to the margin .... *trinotatus* Mel.

Johnson has considered *N. acutirostris* Lw. and *N. wheeleri* Mel. as synonyms of *N. albirostris* Macq. He is probably right in doing so. *N. plesius* Curran must be very close to *N. kansensis* Adams. I can not distinguish it from the description, but I have not seen Curran's types.

Nemotelus (Nemotelus) knowltoni, n. sp.

Nearest to *rufoabdominalis* Cole; but the proboscis is longer, the legs are darker in color, there is less pale coloration on the head, the antennae are black, and the abdomen of the female is in large part black. It is less robust than *kansensis* Adams and *abdominalis* Mel., although about the same length; it may readily be distinguished from those species by the conspicuously white humeri, the yellow tibiae and tarsi, and the white markings on the head.

Male. Head and thorax black, except the frontal triangle, the humeri, and the narrow lateral lines of the pleura, which are ivory white. Eyes contiguous, antennae black; the apical segment of the flagellum (6th) longer than the fourth and the short fifth together. Proboscis long, the labellae longer than the head, rigid, and arcuate. Thorax rather densely white-pilose, especially on the dorsum. Knobs of halteres white, abdomen wholly white, coxae, trochanters, and femora, except their apices, black; legs otherwise yellow. Wings hyaline; veins white; R_4 present; length, 5 mm.

Female. Head with pile similar in density to that of the thorax; a pair of frontal spots and an area on the facial prominence anterior to the antennae, white. Abdomen black; the lateral and apical margins and a median apical triangle on each of segments 2, 3, and 4, white; venter brownish, with an indefinite median area on segments 1 and 2, and the apices of segments 3, 4, and 5, whitish. Otherwise, except sexually, as in the male.

Holotype: Male, St. George, Utah, May 24, 1919. Utah State College Collection.

Allotype: Female, same data.

Paratypes: 4 males, same data.

Nemotelus (*Nemotelus*) *rufoabdominalis* Cole

Cole, Proc. Calif. Acad. Sci. (4) 12: 459.

Two males, bearing the same data as several females, which the author has compared with Cole's type, are herein described.

> Male. Head black; a small spot on the frontal triangle and the upper part of the facial prominence beyond the base of the antennae, white. Antennae yellow, darkened apically; style almost as long as the flagellum proper, and set at an angle to the rest of the flagellum. Thorax black, conspicuously white pilose, the pile of the dorsum appressed; humeri, lateral margins from humeri to wing bases, knobs of halteres, and abdomen, white. Legs yellow, the tarsi becoming whitish; the femora, except their broad apices, and a median region on each hind tibia brownish.

Allotype: Male, Salt River Mts., Ariz., 1300′, May 9, 1926 (A. A. Nichol). In the author's collection.

Another male and several females, same data.

A useful character to distinguish this species from *kansensis, knowltoni,* and other related ones, is the form of the lower section of the proboscis. This segment in *rufoabdominalis* is shorter than the head, gradually decreases in thickness from the elbow to the apex, and curves upward, not downward, at the apex. In these latter two respects, *rufoabdominalis* also differs from the following species, which also has this segment moderately short.

Nemotelus (Nemotelus) montanus, n. sp.

This species was listed as *N. notatus* L. in my paper on the Stratiomyidae of Colorado and Utah (Jour. Kans. Ent. Soc., Jan. and April, 1936), but it is not that species; it differs in the structure of the proboscis, the greater pilosity of the thorax, etc. The proboscis suggests *N. pantherinus* L., but the facial prominence is longer in that species and the pale markings are different. Structurally, however, it resembles these species more closely than it does any Nearctic species known to me.

> Female. Head, proboscis, and antennae black; a cream-colored triangular spot on each side, above the antennae, adjacent to the eyes; facial prominence extending in front of the eyes slightly less than their diameter. Lower section of proboscis slightly shorter than the head, uniformly thickened, the labellae poorly developed. Thorax black; a small cream-colored spot on each humerus. Abdomen black, with the

lateral margin and an apical, median triangle on segments two, three, four, and five; the lateral margin gives off processes running inward at the apices of segments three and four, meeting the median triangle on four; the apex of the triangle on five is rounded. Venter black; a basal median triangle on segment two. Whole body unusually densely clothed with white pile; on the dorsum of the thorax this pile almost conceals the background. Coxae, trochanter, femora except apices, most of the posterior, the median half of the middle, and a median band of the anterior tibiae, black; legs otherwise yellow. Wings hyaline, vein R_4 present, strong veins yellow. Length, 5 mm.

Holotype: Female, along Mosquito Creek, Alma, Colo., July 12, 1927 (S. C. McCampbell). Colorado State College Collection.

The following records extend the known geographical range of the species involved.

N. bruesii Mel. Louisa Co., Iowa, July 7, 1932.

N. bonnarius Johns. 1 male, Gallatin Valley, Mont., July 9, 1903; 1 male, Copperopolis, Mont., July 23, 1902; 1 female, Florence, Mont., July 3, 1912; several males and females, Hennepin and Ramsey Counties, Minnesota.

N. quadrinotatus Johns. 1 male, Donna, Texas (J. W. Monk); 1 female, Brownsville, Texas, July 20, 1933 (R. Nabours, C. Sabrosky).

N. kansensis Adams. Numerous specimens from Kansas, Minnesota, and South Dakota; 1 female, Boulder, Colo., July 5, 1933 (M. T. James).

SOME WESTERN ANTHOPHORIDAE (HYMEN.).

By Charles D. Michener, Pasadena, California.

Anthophora chlorops n. sp.

Female: Like *A. pacifica* Cress. (*A. ignava* Cress.) but tegulae testaceous; apex and posterior side of fore and middle tibiae pale haired, the rest of middle tibiae with pubescence pale in some lights; abdomen not bluish; sternites with more pale hairs; eyes distinctly green (apparently black in *A. pacifica*); hairs of last tergite and apex of fifth dark reddish, quite ferruginous close to sides of pygidial area (these all black in *pacifica*); hair on under sides of fore and middle femora pale, somewhat mixed with dark on middle femora (pubescence of under side of middle femora black, of fore femora mixed with black, in *pacifica*); apex of hind femora with white hairs just above knee plate (black in *pacifica*); head larger and facial line a little longer in comparison to transfacial than in *pacifica;* hind tibial spurs large and stout, as long as hind metatarsus, when the latter is measured to base of second tarsal joint.

North Yakima, Washington, May 23, 1903 (Eldred Jenne).

For comparisons with other related species see a key to the species of this group which will be published elsewhere. The type is in Prof. T. D. A. Cockerell's collection.

Anthophora gohrmanae Cockerell

Two females and a male from Denver, Colorado, May 2, 1902, are evidently typical *A. gohrmanae,* the male being almost exactly like the type.

Four females from Denver (above data), a male from Montrose, Colorado, May 5, 1901, and a male from Grand Junction, Colorado, May 8, 1901, represent a distinct form, as follows:

Anthophora gohrmanae coloradensis n. var.

Male (type): Similar to typical *A. gohrmanae* Ckll. but lower sides of face with some black hairs (only two or three in *gohrmanae*); lateral face marks more deeply notched above; cheeks with more black hairs near eye margin; scutum with some black hairs medianly; fore tibiae with some black hairs; spine of hind metatarsus usually smaller; third tergite practically without light hair; fourth and fifth tergites with less pale than in *gohrmanae;* mandible with a larger yellow spot than in the type of *gohrmanae.*

Female: A few black hairs on sides of face, but variable and intergrading with typical *A. gohrmanae.*

Montrose is the type locality. The type is in Prof. Cockerell's collection.

In both *A. gohrmanae* and *A. g. coloradensis* (males) there is considerable black hair at sides of vertex, overlooked by Cockerell.

I suspect that *A. g. coloradensis* is a sort of northern subspecies of *A. gohrmanae,* differing from typical *gohrmanae* by average characters rather than by differences found in every individual.

Anthophora nigritula Cockerell

Male: Length 7½ mm.; similar to female but more slender; scape yellow beneath except at apex; flagellum less reddish beneath; number of tergites with black bases varies from two to four; apex of abdomen bilobed, the lobes rounded and reddish; seventh segment with dark lateral teeth; hair on under sides of tarsi ferruginous; face narrow; no black hairs on head or thorax.

Tokopah Valley, Sequoia National Park, California, August 20 to 26, 1933, one on a small *Eriogonum,* the others on *Aster adscendens;* Mineral King, Tulare County, California, September 3, 1933, on *Aster;* Erwin Lake, San Bernardino County, California, August 22, 1932 (all Michener, Coll.). One female from the latter locality has more black hair than usual. The male runs to 14 in Cockerell's Key to *Micranthophora* (1906).

Anthophora erythrothorax n. sp.

Female: Length 9 to 10 mm.; black, the mandibles except for the apical part, most of the labrum, and a broad band on the lower part of the clypeus extending upward to a slight point in the middle yellow; antennae all black, the first joint of the flagellum nearly as long as the next three; mandibles bidentate; eyes strongly convergent below, the distance between their lower parts equals about three fifths the length of an eye; scutum dull, very finely and rather indistinctly but closely punctate; scutellum similar, with a raised, shiny, sparsely punctate, basal median area; hair of head and thorax, particularly the latter, bright fulvous, sparser on the head, intermixed with black on the vertex, and replaced by black on the sparsely haired disks of the scutum and scutellum; tegulae ferruginous; wings nearly clear, the veins black, first recurrent joining second submarginal cell at the beginning of the last third; legs black, the small joints of the tarsi reddish, the hairs fulvous, brighter and lighter on the under side of tarsi, distal comb of hind basitarsus black; hind knee plate large, wide and rounded below, narrowed above, longer than wide; abdomen black with broad fulvous hair bands, undulate on their posterior edges after the manner of those of *A. curta* Prov.; fifth segment with dark fuscous hair, the median posterior spot black; first tergite entirely covered with appressed pubescence (in *A. curta* it has only an apical band); venter of abdomen slightly rufescent, with apical segmental fringes of pale ferruginous hair.

Mill Creek, San Bernardino Mountains, California (type locality), August 31, 1930 (Michener). A paler specimen is from Tokopah Valley, Sequoia National Park, California, August 23, 1933 (Michener).

This species runs out at 4 of group D in Cockerell's key (1906). This and the next are the reddest *Micranthophora* which I have seen. The knee plate of *A. curta* (female) is much broader than long and rather small.

Anthophora rhodothorax n. sp.

Female: In general appearance like *A. erythrothorax* Mich. but quite different, really closer to *A. curta.* There is a transverse yellow supraclypeal mark; clypeal band not extending upwards in the middle; posterior knee plate as in *A. curta;* tegulae black; first recurrent vein joining second submarginal cell in the middle; hair on under side of tarsi ferruginous; abdomen marked as in *curta* except for the bright fulvous color; abdominal bands unbroken; first joint of flagellum shorter than in either *A. curta* or *erythrothorax.*

This runs to *A. curta* Prov. in Cockerell's key (1906). It differs in the bright coloration, presence of a supraclypeal mark, etc. If the male were unknown it would be placed close to *curta.* I think there can be little doubt about the correct association of the sexes, although the male is very different from male *curta.*

Male (type): Length nearly 9 mm.; similar to the female; face very narrow, narrowest just below the bases of the antennae; width of clypeus only $\frac{1}{2}$ the length of an eye. In addition to the yellow of the female, the under side of the scape, except at the extreme tip, is yellow. Vertex without black hairs, and disks of scutum and scutellum with only a very little, nearly all of the hair being bright fulvous, even brighter than in the female and in *A. erythrothorax;* abdomen much as in the female, but first tergite covered with appressed pubescence except for a small median area, bands of segments five and six widened by the ferruginous or fulvous color of the integument beneath and beyond them; last segment deeply bilobed, the lobes reddish; sides of this segment with rather slender dark teeth.

Idyllwild, San Jacinto Mountains (Riverside County), California, August 12, 1934, on *Aster* sp.? (Michener).

Emphoropsis salviae n. sp.

Male: Length 13 mm.; black, the clypeus (except two small spots), a line above clypeus, and lateral face marks white; pubescence black, mixed with fulvous on face, replaced by fulvous on vertex, dorsum of thorax (back to the postscutellum, and not extending down on sides below level of tubercle), and first tergite, the scutum with some black hairs intermixed; pygidial area dull, considerably narrower than in *E. birkmanni* Ckll.

La Crescenta, California, on *Salvia mellifera,* April 20, 1935 (Michener).

In Cockerell's key (1905) this runs to the quite different *E. interspersa* Ckll. It is perhaps closest to *E. birkmanni* Ckll., which has brighter red hair, not mixed with black on dorsum of thorax, etc. It is possible, but improbable, that this is the male of *E. pascoensis* (Ckll.).

DESCRIPTION OF A NEW SPECIES AND A NEW FORM OF CATOCALA (LEP., NOCTUIDAE).

BY A. E. BROWER, Bar Harbor, Maine.

The species of *Catocala* which is described is quite distinct from any of the recognized species, and no description known to the author will fit. Thanks are due to persons in charge of the specimens in other collections for the privilege of studying material in their care.

Catocala grisatra n. sp.

Head and thorax gray with darker markings; patagia with median blackish crescent; tegulae margined with black, heavily on shoulder; a double posterior thoracic tuft, blackish anteriorly, with whitish scales centrally, posterior portion tipped with brownish. Abdomen yellowish brown. Fore wings powdery dull bluish gray with darker markings; basal half-line strongly angulate, outwardly angulate behind costa and on radius, strongly angled basally in median portion, then sharply outward and sharply turned to end at the basal dash; transverse anterior line strongly oblique, with prominent outward teeth on the radius and median, curving basally in submedian fold, thence with an outward curve to inner margin; transverse posterior line strongly oblique from costa, the usual pair of teeth short, the upper one much broader and also longest, toothed and scalloped to inner margin, in submedian fold heavy black and running basally to approach rather closely the transverse anterior line, thence strongly bowed outwardly to inner margin, an open loop forms the medium-sized subreniform; a brownish fuscous filling beyond the transverse posterior line margined by the zigzag silvery-gray subterminal line; reniform slightly darker than ground ringed with pale or silvery-gray, regular ovate in shape; median shade outwardly oblique to reniform, prominent on costa; subapical shade well developed, broadening and ending abruptly at reniform; bend of transverse posterior line in submedian fold darker filled; basal dash prominent but short; black marginal crescents filled outwardly with patches of pale scales; fringes dark beyond the veins. Hind wings bright yellow with broad outer and median black bands, the outer band narrowly divided near anal angle cutting off a broad patch, median band angulate rather uniform in width and broadly and bluntly terminating some distance before the inner margin; the apical yellowish patch nearly absent but yellow develops into patches at base of whitish fringes which alternate with fuscous fringe patches. Beneath, yellowish with broad outer and narrow median dark bands. Allotype female somewhat more contrasting on primaries than male. The female from Florida browner and more contrasting, with lighter subreniform. Expanse; holotype male and allotype female 48 mm.; paratype female 55 mm.

Type localities: Athens, Georgia, and Florida.

Types: Holotype male, Athens, Ga., June 14, 1926 (A. G. Richards, Jr.) in author's collection; Allotype female, Athens, Ga., June 24, 1926 (B. Maguire), in Carnegie Museum; Paratype female, Florida (Strecker collection) in Field Museum of Natural History.

This Catocala has primaries which in color and pattern are almost exactly like miniature primaries of *Catocala ulalume* Stkr. (The author refers to *ulalume* Stkr., which is closely related in larval and imaginal characters to *dejecta* and *insolabilis,* and not to the *ulalume* of authors.) Both the fore and hind tibiae are unspined. It will probably prove to be an oak-feeder. The male genitalia bear a general resemblance to those of *Catocala crataegi.* Strecker placed his specimen with *clintoni,* apparently thinking it might be *helene* Pilate.

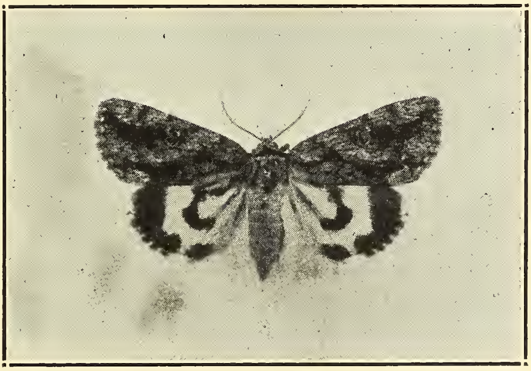


Fig. 1.—*Catocala grisatra* n. sp.
Paratype ♀; actual size, 55 mm.

Catocala amica form **curvifascia** new form.

The form of *Catocala amica* Hbn. with the curved dark shade running from below the apex of the primaries in a deep curve to the middle of the costa is unnamed, and the name *curvifascia* is proposed for it. *Androphila* Gn. was long applied to this form but, as Barnes and McDunnough have pointed out in their "Illustrations of the North American Species of the Genus Catocala," that name is not tenable. A pale specimen of this form is illustrated in the above mentioned work on Plate IX, figure 13. Many inquiries as to the name of this well-marked form have led me to propose this name. The types have the ground color mottled with gray and brown as does typical *amica.*

Type locality: Willard (Greene Co.), Missouri.

Types: Holotype male, Willard, Mo., June 26; Allotype female, Willard, Mo., June 25; both by A. E. Brower; types to be deposited in the U. S. National Museum. Paratypes: eighteen males and ten females; Willard, Missouri, June, July and August; part will be distributed to museums.

The Clerid Beetle, Cymatodera californica, bred from Misletoe in Arizona.—One specimen of this beetle emerged on July 16, 1935, from a number of basal cuttings of the mistletoe, *Phoradendrum villosum,* found growing in abundance on oaks in Florida canyon of the U. S. Range Experiment Station, Santa Rita Mountains, Arizona, in early April, 1935.

These parasitic plants are subject to the attacks of boring insects of various kinds. The cuttings showed unmistakable evidence of the work of Cerambycid and Buprestid beetles and of an unknown species of an Aegeriid moth. However, having been collected too early in the season, nothing else but the clerid beetle emerged. Just which one of the boring insects served as a host could not be determined.

Mr. A. J. Mutchler very kindly named the beetle. He points out its small size, only 14 mm. for a male example, whereas Horn gives 19 mm. for this sex. Feeding upon a starving host, most likely, accounts for the small size.—Geo. P. Engelhardt, Hartsdale, N. Y.

A BIOLOGICAL STUDY OF LYGAEUS KALMII STÅL (HEMIPTERA-LYGAEIDAE).

By William A. Simanton* and Floyd Andre (Co-authorship).

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INTRODUCTION.

While making a search for an hemipterous insect suitable for experimental work in the laboratory, the writers became interested in a rather large lygaeid known as *Lygaeus kalmii* Stål. As this species appeared to be a desirable form to use in studying problems of insect physiology and toxicology (Simanton and Andre, 1935), a large number were reared for experimental purposes. A review of the literature revealed that very little is known concerning the habits of the various species of the genus Lygaeus. During the past three years both field and laboratory studies were conducted on the life history and ecological relationships of this species. The data and observations obtained during this period, together with a description of the life stages are presented in this paper.

RELATIONSHIPS AND HISTORICAL.

Lygaeus kalmii belongs to the hemipterous family Lygaeidae and to the subfamily *Lygaeinae.* The genus, *Lygaeus,* contains a number of species, so much alike morphologically that color markings are used to a great extent in separating the various species. This has resulted in much controversy upon the precise nomenclature of certain forms, especially since some of the species in question show rather wide color variations. The particular species here concerned is an example of such intra-specific color variation. Indeed, the question has arisen whether *Lygaeus kalmii* should be separated into varieties or into two distinct species (Van Duzee 1923, Parshley 1923, 1924). For the most part the writers have dealt with these as the same species in the present paper and have not separated them into varieties, although some data have been collected that might be employed in a varietal separation.

Numerous other citations appear in the literature which deal with collecting records of this species, especially a paper by Townsend (1887) who calls attention to the early papers upon the feeding habits of *L. kalmii* under the name of *Lygaeus turcicus* Fab. and gives some brief notes as to its habits in Michigan.

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LIFE HISTORY.

I. NATURAL CONDITIONS.

Food—Under field conditions both nymphs and adults of *L. kalmii* feed on the juices of green milkweed plants during the growing season. In Iowa the species of milkweed most frequented by them are *Asclepias syriaca* L., and *A. verticillata* L. However, during the late fall and early spring these insects have the ability to survive on the matured seeds, and dehisced pods of milkweed plants.

The Eggs—The ova of *L. kalmii* are deposited in the field in various situations depending on the season of the year. Egg deposition begins in the vicinity of Ames, Iowa, early in April shortly after the overwintering adults become active. The females may deposit their ova in fallen milkweed pods or leaves or they may drop them promiscuously on the ground. Sometimes the eggs are partly inserted in the cottony material of the old pods, and may be deposited singly or in groups of 30 or more.

As the weather becomes warmer and after the milkweeds have grown to considerable size the eggs are often deposited in masses on the leaves or about the pods of the growing plants. They are not, so far as we can ascertain, inserted in the plant tissue.

The Nymphs—The nymphs of *Lygaeus kalmii* begin moving about soon after they hatch. They are noticeably gregarious in habit, however, and tend to gather into more or less small aggregations. Nymphs in the field during the early spring feed on the old pods, stems, and seeds of dead milkweed plants. Some have been observed to suck the stems of bluegrass, apparently in an effort to secure moisture. Later in the season the nymphs feed almost entirely on the juices of growing milkweeds.

If one approaches a plant on which nymphs are feeding, they will drop to the ground and scatter in all directions, a characteristic no doubt which helps to protect them from their predators.

There are five nymphal instars during the development of *L. kalmii.* Preceding each there is a short quiescent period, lasting for from 5 to 10 minutes. During ecdysis the skin ruptures along the dorsal line, the split reaching from the eyes to the second segment of the abdomen. The whole molting period lasts for about 20 minutes, and at this time the nymph is in a very helpless condition and at the mercy of its predators as well as of members of its own species which not infrequently show cannibalistic tendencies.

The Adults—Adults may be found at all seasons of the year. With the advent of warm weather in the spring, mating and egg-laying begin and one may find gravid females from early April to the middle of October. Adults taken as late as November 1 have started to mate and to lay eggs within two weeks after being brought into the laboratory and confined at a temperature of 30° C.

Seasonal Life History—During the growing season of 1933 there were two complete generations and a partial third. This would not be the normal expected thing, however, as we had an unusually warm season, a rather early spring and a late fall; and nymphs in the field were not killed until about Nov. 1.

Briefly, the seasonal life history is as follows: Adults of the second generation pass the winter largely in old patches of milkweed preferring those areas somewhat protected by grasses. Some adults overwinter in dead leaves, trash and fence-rows, and the like. Mating and egg-laying of the over-wintering adults occur early in April. Each female may lay from a few to as many as 1600 eggs. This egg-laying period may extend over a month or more depending on the season. The first new adults appear about the last week in June. Within a few days these mate and begin egg-laying for the second generation which matures during early August. Ordinarily these adults lay a few eggs but nymphs hatching from them do not mature.

LIFE HISTORY IN THE LABORATORY.

For the purpose of studying the bionomic factors of *Lygaeus kalmii,* many cages, some containing individuals and others confining aggregations, were observed under both constant conditions of temperature and humidity and in an out-of-door screened insectary. The investigations at constant conditions were conducted at temperatures of 29.5° C. and 73 per cent relative humidity (saturated sodium chloride solution), 34.5° C. and 76 per cent relative humidity, and in the case of the egg records also at 24.5° C. and 67 per cent relative humidity.

Egg records were obtained from twelve females, four pairs at each of the above temperatures. The cages used were lamp chimneys closed at both ends by means of cheesecloth securely fastened with rubber bands. A number of threshed milkweed seed (*Asclepias syriaca* L. and *A. verticillata* L.), a small vial of water with a cellucotton plug, and a ball of cotton to serve as a medium for oviposition were placed in each cage. Only a single pair of bugs was confined in one cage. The yellowish egg masses usually inserted deeply in the cotton were removed daily and the number of eggs recorded. Observations were also taken on the lengths of pre-coital and pre-oviposition periods.

Following a pre-coital period of three days and a pre-oviposition period of about four days, oviposition occurred over an average time of thirty-eight days at 24.5° C., thirty-two days at 29.5° C. and twenty-four days at 34.5° C. The twelve females laid from a minimum of 807 to a maximum of 1482 with an average of 1029 eggs. The average for the four females at 24.5° C. was 1246, for the four females at 29.5° C., 1140, and for the four females at 34.5° C., 1001. The average size of the egg masses was forty-eight eggs.

Information on the time of incubation and duration of nymphal instars was obtained for constant temperatures of 29.5° C., 34.5° C., and under out-of-door conditions. Eggs of known age and source were placed separately in shell vials that were later plugged with cotton. Six or eight milkweed seeds in each vial were sufficient to rear the individual bugs through the five instars. A wad of moistened cellucotton in each vial, renewed at frequent intervals, supplied the necessary water. The following table shows the duration of incubation and nymphal stadia and gives the comparative rate of growth at 29.5° C., and 34.5° C., as well as for out-of-door conditions.

TABLE.

DURATION OF LIFE STAGES OF L. KALMII STÅL IN DAYS

Temperature		Egg	First Instar	Second Instar	Third Instar	Fourth Instar	Fifth Instar	Total Egg to Adult
29.5° C. (30 bugs)	Min.	3	3	2	3	3	4	18
	Max.	4	4	4	5	6	6	29
	Ave.	3.5	3.1	3	4	3.5	3.8	20.9
34.5° C. (12 bugs)	Min.	3	2	2	3	3	3	16
	Max.	3	4	4	4	4	3	22
	Ave.	3	3.6	3.1	3.6	3.1	3	19.4
Out-of-door (15 bugs)	Min.	7	6	5	5	5	4	32
	Max.	8	9	9	9	9	9	53
	Ave.	7.5	7.4	6.8	6.8	7.4	6.8	42.7

During the life history studies, records were taken of the sex of each individual reared. The records of 116 adults showed 58 males and 58 females, this being indicative of a 50:50 sex ratio.

DESCRIPTION OF LIFE STAGES.

Egg.

The Egg—The ova are strictly of the lygaeid type and ovoid in outline. When fresh they are straw colored and about 1.21 mm. long and 0.56 mm. wide at the widest portion, which is slightly above the middle. The shell is smooth and without evidence of hexagonal sculpturing and the chorial processes around the upper end are ten in number, small in size, evenly spaced, shaped like an inverted bowl, and concolorous with the remainder of the shell membrane.

Instars.

During their development from egg to adult, the nymphs pass through five nymphal instars. A brief description of each follows, and these descriptions have been limited to the variety *angustomarginatus* (dark eastern form).

First Instar—(Fig. 2, Plate V). Shiny, entirely naked, except for numerous fine short hairs on antennae and legs. Antennae and legs grayish brown, except portions separating antennal and the two tarsal segments, which are lighter, and tip of segment 4 of antennae, which is darker. Head, and prothorax brownish, except for lateral margin and mid-dorsal line, which are reddish-orange and concolorous with general body color. Eyes reddish.

Abdomen with lateral margins and two stripes on either side of mid-dorsal reddish area orange-yellow; the other two intervening stripes reddish-orange and concolorous with the mid-dorsal line. Genital spot, repugnatorial glands, and spiracles blackish. Rostrum reaching nearly to the tip of abdomen in newly hatched individuals.

Width across eyes 12; length 32; width across widest portion of abdomen 14. Antennae four-segmented, the segments in the proportions I : II : III : IV : : 2.5 : 3.5 : 3 : 8.5.

Second Instar—(Fig. 3, Plate V). Antennae, legs and dorsal portion of head as well as spots on thorax, genitals, stink glands darker than in first instar. Eyes reddish at outer border but darker towards interior. Orange and reddish lines on abdomen darker.

Width across eyes 18; length 58; width across widest portion of abdomen 32. Antennal segments as 4:7:6:11.

Third Instar—(Fig. 4, Plate V). Nymph darker than in two previous stages. Segment 4 of antennae more prominently darkened towards apex. Forewings distinctly visible and dark brown in color. Spiracles and repugnatorial glands more shiny black. Otherwise the nymph is similar to two previous instars.

Width across eyes .92 mm.; length 4.00 mm.; width at widest portion of abdomen 1.52 mm. Segments of antennae as 5:11:9:17.

Fourth Instar—(Fig. 5, Plate V). Eyes more prominently darkened toward center. Mesothoracic wings reaching to segment 2 of abdomen; metathoracic wings visible along interior margins of them. White area along anterior, posterior and lateral borders of pronotum and around entire abdomen to genitalia more pronounced.

Width across eyes 1.20 mm.; length 4.40 mm.; width across widest portion of abdomen 1.88 mm. which is at segment 4. Antennal segments as 8:15:13:22.

Fifth Instar—(Fig. 6, Plate V). Antennae shiny black except at extreme bases and apices of the segments. Head black except for small areas in front of and behind eyes which have a brownish to orange hue, the former being about the size of the eyes and the latter shaped like a 30–60 triangle and smaller. Dorsal streak on head about 3 times as wide across as the distance across an eye. Eyes darker than in previous instars and concolorous with darker portions of head.

Pronotum orange, a faint streak of white along anterior and posterior margins—in some specimens entirely covered with orange. Two large brownish-black spots to each side of center line of pronotum which vary in size with the specimens examined but are as long as segment 1 of antennae and ½ to ¾ as wide.

Mesothoracic wings black, reaching to segment 3 of abdomen, the under pair being visible on the inner margin.

Abdomen orange, with two lighter streaks to each side ot center line; genital area, spiracles, repugnatory openings, and legs, black.

Width across eyes 1.64 mm.; length 6.82 mm.; width at widest portion of abdomen 3.80 mm. (segment 4). Antennal segments as 13:27:20:30.

Adult—Elongate and oblong. Black and red with pale margins on the margins of the membrane and white spots on the disk in some individuals; on others these are entirely lacking.

Clavus black. Prominent red spot on the vertex of the head. Front lobe of pronotum entirely black; hind lobe with a broad red band across the middle. Corium reddish except for an irregular black spot behind the middle and reaching almost to the margin. Scutellum, sterna, antennae and legs black. Abdomen red. Two rows of black spots are evident along the middle and another at the margin of each side of the abdomen. Genital plates and sixth abdominal segment black. Rostrum reaches coxae. Side margins of pronotum rounded. Transverse elevation is visible in front of the middle of the scutellum.

Width across eyes 1.72 mm.; length 8.00–11.50 mm.; width 4.00 mm. Antennal segments in the proportion as I : II : III : IV :: 16 : 37 : 28 : 33.

COLOR MARKINGS.

Early in the course of this investigation considerable variation was noticed in the color of the nymphs. The coloration often varied from gray to bright red. It was also noticed that both the eastern and western forms of *Lygaeus kalmii* occurred in approximately equal numbers throughout the State of Iowa. One thousand specimens were counted at random in the field at several localities in the State and it was found that 49% were distinctly of the eastern type, 49% distinctly of the western type and 2% questionable.

In the laboratory virgin females of each form were mated with males of like coloring and observations made of the resulting offspring during their entire development. A second generation (F_1) was reared from typical specimens of each form and observations were made on these offspring.

Five pairs of adults of each form were placed together in a large cage supplied with food and water, and allowed to reproduce unmolested.

From data accumulated in the manner described above the following results were obtained.

Eastern forms (no spots on membrane) produced 83 individuals, 71 of which were entirely without spots, 10 with a faint spot and 2 with distinct spots on the membrane.

The F_2 generation from unmarked eastern forms produced 20 adults all of which were unmarked.

Western form (2 distinct spots on membrane) produced 63 individuals all with distinct spots. The F_2 generation produced 74 distinctly spotted specimens and 1 with faint spots. An F_3 group showed 47 typical and 3 with faint spots.

Adults of the two forms will interbreed freely in the rearing cages, producing a variety of intermediate forms in addition to distinct types.

PARASITES.

During July and August, 1935, approximately 80 per cent of the adults of *Lygaeus kalmii* collected in the field were parasitized by a Tachinid fly belonging to the genus *Leucostoma.* As a result of this the adults of *kalmii* became quite scarce, and during early September were rather difficult to find. Several hundred eggs collected from the field at various times of the year were hatched in the laboratory in an effort to rear egg parasites. However, none were found at any time.

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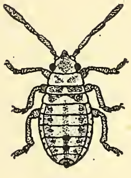
PLATE V



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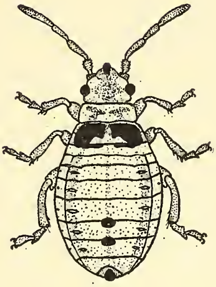

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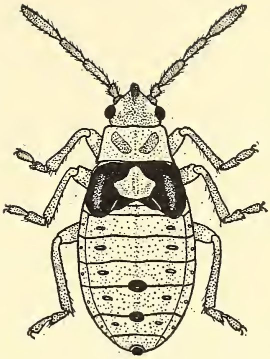

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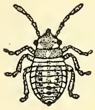

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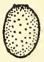

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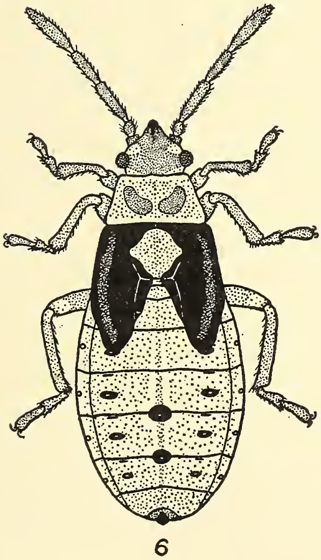

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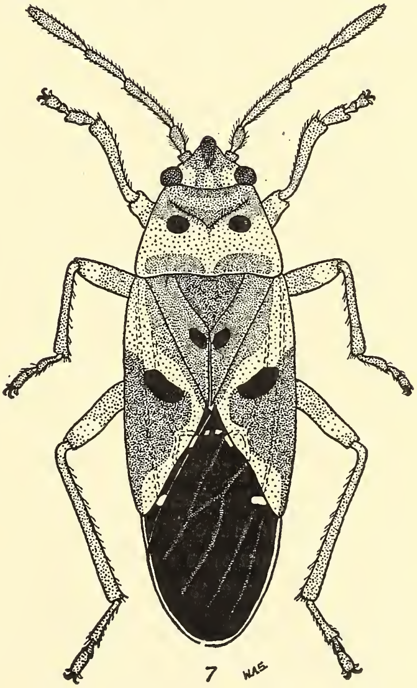

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ADDITIONAL DATA ON THE BIOLOGY AND ECOLOGY OF STRIGODERMA ARBORICOLA FAB. (SCARABAEIDAE-COLEOPTERA).*

By Clarence H. Hoffmann, Morristown, N. J.

During the years 1932 to 1935, the writer made a number of observations on the biology and ecology of *Strigoderma arboricola* in Minnesota. All rearings were undertaken in 1932 and culminated early the following year. Mated pairs were isolated in four-ounce salve tins supplied with damp soil and a few rose blossoms for food. The soil was examined daily after oviposition began, and the eggs obtained were transferred to cavities in dampened soil within two-ounce salve boxes and covered with soil to conserve moisture. Following hatching, the grubs were placed in jelly glasses containing blue grass sod in which later transformations occurred. These containers were kept in a basement room which maintained a rather uniform temperature of 23° C.

Habitat.—According to the observations and literature cited by Hayes (1921), *S. arboricola* is recorded as having been captured on the flowers of the following plants: wild and cultivated roses, red clover, *Opuntia humifusa, Monarda punctata,* blackberry, water willow, *Dianthera americana* Linn., cactus, timothy, elderberry, dewberry, dog fennel, *Verbena stricta,* wild parsnip, *Plantago, Saponaria, Tephrosia,* and *Erigeron.* In Minnesota, I have taken adults on the flowers of both wild and cultivated roses, water lily, *Phleum pratense* L., *Achillea millefolium* L., *Amorpha canescens* Pursh., fireweed, and peony. When abundant, the adults of this species cause considerable damage to cultivated roses by destroying the buds and flowers through feeding activities. Large numbers of adults were also taken on wild rose blossoms, especially on those plants growing along roadsides. On June 25, 1932, 41 females and 34 males were taken on the blossoms of wild rose plants which were growing on one side of a sand dune blow-out. This collection was made about eleven o'clock in the morning, and the beetles were taken only on those plants exposed to the direct rays of the sun. The beetles also frequent bogs and feed extensively on the petals of water lily blossoms. As many as 18 adults were collected from a single blossom on June 28, 1932.

Egg Stage.—The eggs of *S. arboricola* when freshly laid are elongate-oval in shape and pearly-white in color. Measurements of six of these eggs averaged 1.49 mm. in length and .96 mm. in width. As development proceeds the eggs increase in size and assume a more globose form. Shortly before hatching the eggs became minutely alutaceous, cretaceous in color, and measure 1.88 mm. long and 1.52 mm. wide. The average duration of the egg stage for 36 eggs was 17 days, with extremes of 11 and 25 days. Hatching occurred the last part of July and the first part of August.

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* Paper no. 1420 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.

Larval Stage.—Hayes (1921) reared four larvae to maturity and found that the duration of the larval stage varied from 326 to 331 days. These grubs were fed bran until the second molt after which wheat grains were substituted. The three grubs I reared to maturity required from 160 to 164 days to complete their larval development on blue grass sod. Adult emergence occurred about the middle of January. This was a surprisingly early date inasmuch as the length of the developmental period of other scarabaeid larvae (*Trichiotinus* and *Pelidnota*) reared under the same laboratory conditions was accelerated only a few weeks in contradistinction to conditions in nature.

On September 15, 1932, a practically mature larva was collected beneath horse dung in a pasture near Anoka, Minnesota. This grub became an adult in January, paired with a laboratory reared male, and deposited fertile eggs. The above record, I believe, is the only recorded instance of a larva of this species being taken in nature. Whether this particular grub passed its early development in the manure or upon the roots of nearby vegetation can only be conjectured. Thus, the feeding habits of the larvae have not been determined under field conditions; therefore, the economic status of this stage is unknown.

Prepupal and Pupal Stages.—Shortly before prepupation, the larvae cease feeding and form elongate, slightly curved earthen cells, which are about 30 mm. long, 10 mm. wide, and 9 mm. deep. Within these cells, a prepupal period of approximately 6 days and a pupal period of about 13 days are passed. The pupae of *S. arboricola* vary from 9 to 12 mm. in length and from 4.5 to 6 mm. in width. Recently transformed pupae are light brown in color but they gradually darken as the adult colors are assumed.

Adult Stage.—In Minnesota, adults of this species were collected in Pope, Ramsey, Hennepin, and Anoka counties. Mating, which may be consummated in two minutes or require as long as 15 minutes, has been observed to take place on wild rose blossoms during the latter part of June. Following a preoviposition period of 11 days, fertile females deposited their eggs singly in the soil.

Fecundity records maintained for 14 females show that they deposited an average of 4.4 eggs (minimum 1, maximum, 14 eggs) during their life under laboratory conditions. The average span of life of 21 beetles kept under the same conditions was 18.8 days, with extremes of 11 and 31 days.

Literature Cited

Hayes, W. P. 1921. *Strigoderma arboricola* Fab.—its life cycle (Scarab. Coleop.). Canadian Entomologist 53(6): 121–124.

Cissia mitchelli in New Jersey.—The Satyrid butterfly, *Cissia mitchelli* French, is recorded in the N. J. List of Insects, J. B. Smith, 1899, from Dover, N. J., in June, with the remark "it seems to be rare." This record appears again in the subsequent list issued in 1909, indicating C. W. Johnson as the collector and the statement "no other recent captures." Holland's Butterfly Books says it has been collected near Lake Hopatcong. All these records are based on the single capture by Johnson, approximately 40 years ago. The butterfly has not been turned up again in New Jersey, nor has it ever been recorded from New York State. What became of Johnson's specimen is not known. It has not been deposited in a museum collection.

This answers an inquiry by W. S. McAlpine, of Birmingham, Mich., regarding the status of *Cissia mitchelli* in New Jersey. Mr. McAlpine has been collecting this butterfly in Michigan. He has obtained eggs and is carrying over winter a number of the larvae. When Mr. McAlpine has completed his life history investigation, we hope to publish it in the Bulletin.

The habitat of *Cissia mitchelli* in Michigan, according to Mr. McAlpine, is along very narrow grassy strips bordering small water courses in the midst of a dense tamarack swamp. This almost inaccessible haunt undoubtedly has had considerable bearing on the scarcity of the butterfly in collections. It has been collected also in Ohio. Any additional records would be appreciated by Mr. McAlpine.—Geo. P. Engelhardt, Hartsdale, N. Y.

THE PERMANENT PRESERVATION OF INSECTS.

By Walter S. Wormser and Wm. P. Hayes, University of Illinois.[1]

Introduction.

Throughout the entirety of technique papers very little mention has been made of the method of hermetically sealing insect specimens in glass tubes, and there is available at the present time no single article organizing and presenting the specific operations in the procedure. Although the paper of Kelsheimer[2] deals with this subject, it emphasizes preservative methods rather than actual procedure in the preparation of such mounts.

Because this work has been carried on at the University of Illinois since its inauguration by R. D. Glasgow, and because many later improvements upon those already noted have been devised which facilitate ease of manipulation and insure uniformity, beauty, and permanency to materials of widely diverse natures, it is believed that a description setting forth these improved methods, concerning which numerous inquiries are received, and stating in detail the progressive steps in the operation, will prove of value to all who wish to incorporate beauty and permanency in their material.

It has been noted by many that the art of glass manipulation has the conspicuous disadvantage of being to a great extent incommunicable. Nevertheless, if the methods here propounded are attended upon by diligence and exactitude on the part of the worker; and if precautions here indicated, which experience has shown to be necessary, are mastered, the technician will be in a position to modify and to introduce new details of manipulation as individual desire or need might dictate.

Requisite Materials.

The essential equipment for hermetic preparations includes:

Blast Lamp. A burner of the type shown in figure 12 common in chemical laboratories and sold by all biological supply houses, is preferable. Many types are on the market and the worker must familiarize himself with the demands peculiar to the burner employed. In general, however, all approximate the fundamental plan in the burner illustrated. There is an outer pipe (A) containing an inner pipe (B) which is connected with the air-conductor (C). Gas passes in from D into the intermediate space between pipes A and B, and is driven by the rapid currents of air from all sides into the collar (E) before it attains the state of combustion. In addition to the gross variations of flames secured by the gas and air valves (D and C), by moving the collar the relative access of gas and air may be minutely regulated. Pulling it out produces a finely pointed flame. Pushing it in produces a broad, brush-like flame. Thus are secured flames sufficiently varied and precise to meet the demands of all work encountered.[3] This burner is attached to a stand (G) by a double ball and socket joint which allows the flame to be played in any desired direction.

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[1] Contribution from the Entomological Laboratories of the University of Illinois, No. *179*.

[2] Kelsheimer, E. G. The Preservation of Immature Insects. Ann. Ent. Soc. Amer. Vol. 21, pp. 436–444, 1928.

End-Ligature Tubes: These are specially processed tubes of the test tube type, exhibiting greater clarity and a minimum of distortion, especially so at the closed end, where the specimen is lodged. Varying diameters may be secured ranging from one-sixteenth of an inch to four inches, in one-sixteenth inch increments.

Preserving Fluid: Where specimens are not to be mounted dry, they will require some agent for the maintenance of their natural appearance; the material will of course determine the fluid to be used. For insects, varying concentrations of alcohols, from 70–90%, are employed, 83–85% being the stock solution most frequently used, due to its yielding the greatest efficiency of preservation as well as giving the least aberration when used with the general types of glass supplied in the ligature tubes.

For plant specimens which illustrate insect damage and for botanical material in general the following preservative is recommended:—

(A) Prepare a solution containing:
50 pts. glacial acetic acid
50 pts. water
Add crystals of copper acetate to form a saturated solution.

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[3] For a more complete discussion of the nature of blast-lamps and their sundry flames consult H. Ebert: "Anleitung zum Glasblasen," Johann Barth, Leipzig—1921, 110 pp.; F. C. Frary, C. S. Taylor, and J. D. Edwards: *"Laboratory Glass Blowing,"* McGraw-Hill, New York; R. Threlfall: "On Laboratory Arts," Macmillan, London, 1898, 330 pp., 1928, 107 pp.

(B) Prepare a second solution containing:
14 pts. formaldehyde
86 pts. water

Boil the plant gently for ten minutes in solution A. Remove and preserve in solution B. The green coloring now obtained in the treated plant will prove to be indefinitely stable, being due, of course, to the replacement of the magnesium salts of the chlorophyll by the copper salt of solution A. It is only rarely that the preserved specimen is off-color, attaining at such times a deeper than normal green.[4]

For a solution of calcium chloride and formalin (much less expensive than the costly alcohol-glycerine) to preserve the natural colors of injected dissections as well as original colors of animal tissues, small invertebrata, etc., consult: E. Souchon, "Anatomical Record," Vol. 18; No. 4, p. 36, 1920.

Labels: All labels should be uniform, preferably printed in large blocks with the name of the institution, department, or individual to whom they belong, and reasonable space for essential data. A recommended size is $1'' \times \frac{1}{2}''$. For classroom use it is suggested that the specimens be preserved in the form of unknowns, the code number, or the code number plus the habitat, being the only entry upon the label. The departmental records should include under the corresponding code number full information as to the taxonomy and collection data of the specimen, as well as the data and date of preservation, in order that whenever early deterioration or excessive breakage occurs due to a fault in the mounting process this may be traced, and thus prevented in future mounts.

Additional Accessories: Medical cotton of a fine grade is required for use as plugs in restricting the specimen to the lower half of the tube as described later on. Glue of a non-smearing nature is employed to fix specimens in place in certain types of mounts as later described. Where used in liquid-mounts it must also be alcohol-proof. Glass files or knives should be handy and in good quantity. A sharp, clean file insures efficiency of procedure in all glass work.

PROCEDURE.

The methods of mounting and sealing vary with the requirements imposed by the specimen, or by the use to which it is to be put.

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[4] For additional preservatives and botanical methods consult: "Encyklopadie der Mikroskopischen Technik," Urban & Schwargenberg. Berlin—1903.

There are, however, certain preliminary essentials, required for all types, to which a brief discussion must be devoted.

Tubes are selected upon two criteria. The specimen is either to be held in place by the confining glass walls, or is to be mechanically supported midway between the walls. If the insect is to be held by the walls it should lightly contact the glass, the tube's diameter exceeding that of the specimen by not more than the space requisite for insertion. If supported midway between the walls the tube's diameter should exceed that of the specimen by at least one-fourth inch.

The tubes are washed thoroughly, rinsed in alcohol, and set aside in closed containers to await further use.

The essential data is entered upon the labels, which, if intended for dry mounts, are set aside until needed. However, if they are to be used in liquid mounts they must first be soaked in 70% alcohol until the soluble excess of printer's ink has been extracted. Failure to previously soak printed labels results in their subsequently discoloring the liquid in the tube. In both dry and liquid mounts the label should be inserted in the tube between the cotton plug and the wall of the tube.

The specimens must be washed thoroughly in alcohol to remove any grit, frass, or other extraneous material that might tend to become dislodged in the tube after a period of use. Great care should be exercised in this preparatory step to insure the longevity of the original clarity of the mount. Specimens to be mounted dry should first be washed in warm alcohols of medium concentration, then placed into absolute alcohol until ready for insertion. Material from the field often harbors spores which, not being destroyed, germinate within the tube nullifying all previous and subsequent labors. The warm alcohol acts to destroy any such material; the absolute alcohol prevents the retention of any moisture by the specimen which might later condense upon the inner surface of the tube and destroy visibility.

The individual tubes are then removed from their containers, and the intended point of attack by the flame is indicated by an ink mark. This point is arrived at from a consideration of the length of the specimen, plus the length of the plug used, plus the distance required to insure the non-scorching of the cotton plug. This distance from the plug is usually twice the diameter of the tube.

At this point in the procedure different processes follow, depending on whether dry mounts or liquid mounts are to be made. The manipulations in all of the above preliminaries, and in the earlier stages of each of the following procedures, may be carried on practically simultaneously, one or more being passive while another is being worked upon. Only a little experience is needed here to show the worker how much valuable time might be saved by thus telescoping his activity.

Dry Mounts: Cotton strips for plugs are cut at a width corresponding to the length of the label. Plugs are formed by tightly rolling the cotton strip and cutting it at a point where it will be loose enough for insertion, yet tight enough to lodge securely once in place. Onto these plugs the labels are fastened with a smear of glue, merely enough being used to keep the label in place during its insertion into the tube. The specimen is then inserted loosely into the tube, the head always towards the closed end, to be followed by the plug with its superimposed label towards the observer when the specimen is to the left. The plug should be pushed in far enough to prevent the insect from moving. The intended point of constriction is checked, and the tube is now ready for the sealing processes described farther on.

Liquid Mounts: In the use of a liquid preservative the problem of an air bubble is omnipresent. Forever between the observer and the specimen, the bubble is not only exasperating, but makes accurate observation an impossibility. To eliminate this problem, a glass valve (Fig. 10) designed by R. D. Glasgow is substituted for the plug used in the dry mount, about which cotton is wrapped and glued in place, and the label is then imposed upon the cotton. The valve is so inserted that the constricted end is away from the specimen. All air in that part of the tube beyond the specimen compartment will be unable to pass back through the neck (A) but rather will lodge in the elbow area (E) ; this is invariable. On the other hand any bubbles which might accumulate in the specimen compartment (from interstices in the cotton), will pass freely through the larger aperture (S), if aided by gentle tapping and shaking of the tube. The initial amount of air present at the sealing of the tube, together with any additional air that might be displaced at a later date, is thus always potentially relegated to that portion of the tube where it is of no significance. The method of making the valve is described later after the sealing processes are considered.

In rolling the cotton around the valve it should be made to overlap at the wide end neatly and uniformly and only to a slight degree, so that when the valve is in place it will be retracted within a pocket formed by the cotton. In this way there is no possibility of the formation of an elbow area in the specimen compartment. Whenever, in the insertion process, the valve is pushed beyond the surrounding collar of cotton, it is best to remove the entire valve, rewind new cotton, and reinsert. A valve with its wide end beyond the cotton is worthless. The cotton should now be neatly trimmed at the shoulder, the marked point of constriction checked, this time measuring from the end of the valve rather than from the cotton, and the tube is now ready for the sealing processes.

Although the mastery of the method of hermetically sealing specimens lies in the mastery of the manipulation of the tube in the flame, now to be described; once this is secured it becomes of secondary importance only. The ultimate worth and beauty of the mount will depend upon the mounting procedures: *i.e.,* whether the specimens, the glass and the liquid are clean, whether those specimens that are cemented are secure and unsmeared and whether the cotton and label lie neatly in place, and the cotton is trimmed to the exact proportions. All of these minor mechanics when executed with *finesse* and care bring out the true worth of good material well prepared.

THE SEALING PROCESSES.

A general manipulatory knowledge of the flame in which the glass is to be worked is fundamental if the tubes are to be successfully fashioned. The work in hand determines the size and heat of the flame, the larger the diameter of the tube, the larger the flame required. In considering the operation of the blast burner we have seen that flame variations from a sharp, short needle-point to a very wide brush can be secured. Five minutes spent with the burner in experimental adjustments will prove more profitable than pages of description. The one concrete suggestion at this point is that, in all instances, the burner should be regulated so as to provide a smooth, regular flame of well-defined parts. When the glass seems to melt too quickly, by getting out of control and "folding" upon itself, reduce the rapidity of the flame to a point where you are not hurried by the rate of the melting process. By rapidity of the flame is here meant the BTU values supplied per given time, and not the relative proportions of compressed air and gas composing a given flame. In other words, in "slowing down a flame" reduce the gas and air supply in equal proportions. On the other hand in cooling a flame have the reduction of the amount of gas supplied exceed the reduction of the supply of air. Dexterity attends upon experiences and in time flames of speeds and heats will be used which were impossible to employ when first beginning the work. This, of course, is a goal towards which to strive, for the faster the flame used the quicker is the work accomplished, an important item in laboratories where time is a factor.

There are three, fundamental, glass blowing manipulations involved in the sealing of the specimen tube: (1) rotating the tube, (2) constricting the tube, and (3) drawing out the tube. The mastery of these three operations is the mastery of the method itself. In passing, it should be noted that not of little importance is the practice secured by the laboratory worker in the fundamental operations of glass manipulation, for this forms an invaluable asset to any investigator with ingenuity.

Rotation of the Tube. In order to secure even heating at the point of the flame's attack, the tube must present its entire circumference to the flame. This is accomplished by slowly rotating the tube in the flame, holding it at the horizontal with the ends resting ventrally on the second finger, which is curled in nearer to the body than is the first. The palms should be facing each other and the fingers curled in to face the body. The tube is thus held laterally by the first finger, and dorso-laterally by the thumb. Rotation is accomplished by rolling the tube between the first and second fingers and thumb of each hand. By moving the thumb upwards at a sixty degree angle the rotation is incited, and by accompanying this thumb movement with a simultaneous counter movement of the first finger the rotation is continued. The rotation thus consists of a series of short light touches, each one moving the tube only a part of the way around. The tube is steadied and held in its initial position by being couched in the angle formed by the first and second fingers, the activity of the second finger being otherwise only variably supplementary. It will be found that the second finger is automatically used to steady the rotating tube. When tubes exceed a diameter of an inch and a half, more fingers will of course be brought into play. However, since the majority of the preparation work will be done with tubes of smaller diameters, and since the successful handling of large bore tubes is contingent upon a previous mastery of sealing the smaller diameters, it is unnecessary to enter into a discussion of manipulations involved in large pieces of work. The principles are identical with those embodied in this discussion.

In the beginning, practice will be needed in order to attain a proper coordination and dexterity of the fingers; this is to insure both ends of the tube being revolved at the same angular velocity, notwithstanding their differences in weight. The slightest discrepancy between the rate of rotation and the two portions of the tube will result in the twisting, crumpling, and distortion of the heated strip. If, as is usually the case, this twisting persists even after many trials, attempt to correct the distortion by reducing the rate of rotation of that side which has the greatest velocity. It will be found that the glass will prove more amenable to restoration, even after having been considerably distorted, than is usually thought possible. There are very few instances of one side "getting ahead of the other" that cannot be remedied by changing the rate of rotation of either hand.

Rotation is essential throughout the entire process of constricting, drawing out, and sealing the tube. Not only does it insure even heating, as mentioned above, but it also equalizes the effect of gravity upon the hot, soft, glass in the process of constriction where it would otherwise fall out of shape. In drawing out the constricted tube, continued rotation keeps the melted part corrected aligned with the central axis, thus insuring the symmetry of the constriction. Throughout all of these operations, with the exception of the initial rotation, warming of the tube should proceed leisurely. Slow, steady revolutions allow the operator full mastery of all operations, and until such time as perfectly coordinated rotation of the tube becomes automatic the operator should confine his activity to slow rotations in slow flames.

Constriction of the Tube: The tube, with the specimen end held in the left hand, the open end in the right, is introduced slowly into the flame, first merely above it in the hot air, then shortly in front of it, until reduction is indicated by a yellowing of the flame, and finally it is plunged directly into apposition with the oxidizing point. During all of these operations it is moved back and forth along its axis in order to warm the glass on either side of the intended constriction. Upon being plunged into contact with the oxidizing point this horizontal motion ceases, leaving rotation, as described above, as the only movement of the tube. The tube is held steadily and rigidly, without pulling or pushing, to the point of the oxidizing flame, which, after a brief moment, will begin to cut its way into the glass. As this cutting process proceeds (Figures 1–4) the tube must be continually moved down upon the flame in order to *keep the point of the inner oxidizing flame always in contact with the glass,* and to keep the outer cone playing heavily upon the shoulders of the incipient constriction. As the cutting-in process of the flame continues the difficulty of the rotating process increases. The hot, molten glass, at the point of attack, tends to yield to the heat, thus giving no support to the hands as they attempt to continue the rotation. This difficulty must be coped with by taking up most of the weight of either side in the respective hand

and not depending upon the one hand to counterbalance the other as they do when the center is not molten. Rotation can here proceed only at the slowest possible rate yet it *must proceed regularly.* When the constricting glass is perceived to be on the verge of meeting in the center, the tube is removed from the flame, instantaneously shifted to the vertical, with the right hand on top, and is now ready to be drawn out.

In following out the above procedure, there exists a difference of opinion as to what part of the flame the tube should be held in during the final moments of the constriction. It cannot be held within the oxidizing inner cone, for the flame will then constrict the glass at the two points coinciding with the circumference of the cone. If held away from the oxidizing point the constricting process will proceed less rapidly. Undoubtedly when first becoming acquainted with the operation holding it away from the oxidizing point is best. However, once dexterity, even to a small degree, is acquired, all work should be done *right on the oxidizing point.* This not only adds to the speed in which the work is accomplished but also to the sharpness and neatness of the resulting constriction.

Drawing Out the Tube: Having removed the tube from the flame and shifted it to the vertical position, in order to utilize gravity as an assistance rather than fight against it, the two parts of the tube must be pulled apart so that the glass at the region of attack, which is now a thick molten mass, might be thinned out. The usual tendency is to pull both ends immediately and violently apart, thereby producing a constricted region of some twelve inches or more whose walls are much thinner than are those of the main tube. Actually, however, a constricted portion of one inch is not only sufficient but much the simpler and more gratifying procedure. Having turned the tube to the vertical hold it there for a moment without pulling apart. This will give the constricted portion time to partially set, and upon pulling apart a moment later it will be seen that one or two inches is the maximum distance that the two parts will separate (Fig. 4). In following this procedure the wall of the constricted part will usually always be thicker than that of the main tube, a feature adding to the strength of the work. Though the glass walls can be made so thick as to reduce the center bore to one of capillary dimension, care must be taken not to close the tube entirely. The insertion of the preservative, and the final sealing are to follow.

The constricted portion is now filed and broken to leave a short stub-like neck. Long needle-necks invite easy breakage; short stubs are practically fool-proof. The tube is then ready for the final sealing process. If a dry mount is being prepared the sealing process is now ready to follow. However, if the mount is of the liquid type, having a liquid preservative, the fluid must first be inserted. This is accomplished by simply placing the tube within one of a slightly larger diameter that has been previously filled with alcohol, and applying the end of a suction pump or simple water aspirator to the outer tube (Fig. 5). In the absence of a suction apparatus the filling may be accomplished merely by oral suction produced by placing the mouth over the larger tube and taking in several short, sharp breaths. This method has been found to be superior in many points to that wherein the liquid is poured into an atomizer bulb, the bulb placed over the neck and the liquid squirted in. When tubes are encountered whose walls have been constricted to a point where only a fine capillary has been left in the center, the liquid will enter only after long and laborious forcing, if at all. The vacuum method of course allows one to thicken the walls of the bridge (*i.e.*, the constricted portion) to almost a solid piece of glass, without hindering the filling process in the least. The tubes are now ready to be sealed.

In sealing the tube, hold it at the vertical, having adjusted the burner to throw its flame horizontally. Carefully warm the extreme tip, then thrust it into the oxidizing point and rotate. The inner bore will first be seen to fold in upon itself (Figs. 6 and 7), gradually completing its closure. Just at that point where the two sides of the inner bore meet (Fig. 8), forming in themselves a miniature bottle-neck, remove the tube from the flame. The additional melting that occurs between the time the tube is removed and final cooling sets in is usually sufficient to completely close over the hole (Fig. 9). Failure to extract in time results in a "dumb-bell-tip" formation, structurally very weak, and frequently quite unattractive. Where sealing is done with alcohol mounts the following precaution must be kept in mind. When the tube is extracted too late the tip will blow off rather than form a dumb-bell figure, due to the pressure of the now heated and consequently volatilizing alcohol. This merely consists of a popping of the extreme tip bubble, that forms with extreme rapidity, but it leaves the tip of the tube in a sufficiently distorted condition to necessitate the entire repetition of the sealing process, unless enough space has been allowed in the initial filing of the neck to allow for a shortening and a re-sealing. This factor will only trouble the beginning worker. A few experiences will fit him to seal hundreds of tubes without extracting a single one too late. The level or amount of the alcohol to be put in a tube deserves consideration. The more alcohol present the smaller will be the air bubble, and yet the closer the liquid is to the tip the quicker will it become heated to volatilization and endanger the success of the final sealing. In general the shoulder is the highest mark to which the larger tubes can be filled, and in smaller ones, where capillarity enters as a factor in carrying the alcohol up to the tip, the distance from the tip should be increased as experience instructs. It follows, that when the work is first attempted these distances should be increased, and that when ample dexterity is attained they may be decreased to within the minimum limitations attainable.

The tube, now sealed, should be allowed to cool, then inverted and tested with the tongue. The absence of any tell-tale alcohol taste confirms the soundness of the seal. The tubes are now ready for storage, display, or filing in the collection. With even the hardest of class-room usage they should last for a number of years.

Making the Valve and Valve Rod: Valves (Fig. 11) are prepared from stock ligature tubes or other glass tubing in a sufficient assortment of sizes to answer to the needs of the specimens to be mounted. There should be a series of valves available for each tube size in order to prevent the necessity of using small valves in large carrying tubes, the results of such procedure being already noted. In drawing out the valve proceed as if constricting a specimen tube, drawing it out, however, at the incipient constriction (Fig. 2) rather than allowing the glass walls to be deeply cut. The bridge and the main tube should be so filed as to produce short-necked valves having a length equal to that of the label employed, at least two valves being thus obtained from each tube.

In preparing and using the valve certain precautions should be noted. In choosing the tubing from which to draw the valve select a size only slightly under that of the carrying tube, which allows only the necessary space for a thin layer of cotton and the label. To use a small valve in a large tube, making up the difference with a thick roll of cotton, would be to create an elbow area in the specimen compartment, thus defeating the entire purpose, for though no air would pass into the specimen portion, likewise none could pass out of it. Where tubing of $\frac{3}{16}$ inch diameter or less is used no valve need be employed. Merely roll and insert the label without a plug which, because of the high surface tension and capillary nature of small bore tubes, will effectively check the passage of the bubble into the specimen compartment at the horizontal, and will allow it only a very slow access at the vertical.

In suspending alcohol specimens rigidly within the center of the tube in liquid mounts a glass rod, melted onto the valve (Fig.

11), is used as a means of suspension. A glass rod, of a size sufficiently strong to support the weight of the specimen and yet not large enough to distort it upon piercing the body, is selected. To fuse the rod to the valve, warm both up slowly in front of a small, slow flame, rotating all the while until a yellow flame indicates the appearance of reduction. Move the valve out to the colder regions of the flame at the same time thrusting the solid rod into the oxidizing point, keeping it there until it attains a state of fluidity. At least one-half inch of the rod should be so affected. Now, keeping both the valve and the rod in the flame, quickly lay the molten end of the rod immediately within the rim of the valve, pressing gently to effect a complete fusion of the two elements, at the same time applying pressure in order to bend the rod upwards at a 60-degree inclination from its point of contact. At the point where the central axis of the valve crosses the rod, rebend the rod so that its long axis lies in the axis of the valve. Thus the specimen impaled upon the rod will lie in the center of the tube. By applying the flame at the desired length pull the rod into a needle-point. The rod when thus completed should be nearly the entire length of the larvae to be mounted or half the length of adults.

Having mastered the fundamental operative procedures in the hermetic process we may focus our attention upon the secondary and supporting operations, the proper execution of which determines the relative effectiveness and general appearance that is to be attained. Within a very short period the rotating, constricting and sealing processes will be relegated to the automatic, leaving the energies free to an extensive development of different ways of mounting and displaying the materials to be included within a given tube.

TYPES OF SPECIMEN MOUNTS.

Here again we encounter the question, namely, whether or not the specimen requires a liquid preservative. The insect may be inserted freely in the tube, being kept in position either by (1) lateral confinement afforded by the glass walls, or by (2) a cephalic and caudal confinement afforded by the tube's end and the cotton plug. Besides being the most simple and easily executed method, this usually fulfills most requirements equally as well, if not better, than any of the following more complicated methods. Where twigs, for example, that illustrate insect damage, pathological abnormalities, or structural deformities and oddities are to be mounted they need merely to be inserted, held in place between the end of the tube and the cotton plug, and the mount is completed by the sealing of the tube. The most important consideration to note in this method is that of having the specimen held stationary within the tube. Specimens which move around promiscuously do not last long, nor can they always be observed in the desired position.

The alcohol specimen may be freely inserted as described above for the dry type. Here, especially, must the carrying tube's diameter not exceed that of the specimen by more than the amount required for insertion. Failure to adhere to this will not only result in the continual floating of the specimen, but, when the discrepancy has been sufficient, in the specimens falling into and becoming hidden by the valve. Where it is desired that small specimens, because of tortuousness or other reasons, be mounted in large carrying tubes the second method, described below, should be followed. For small larvae, pupae, and eggs that do not adhere in large masses, and for small alcohol specimens in general the method wherein a rolled label is substituted for a valve in a tube of capillary bore, should be employed.

It is sometimes desirable to suspend the specimen midway between the walls to insure absolute rigidity of position, coupled with freedom from the surrounding tube. This is accomplished by impaling the specimen upon a steel needle, or a glass rod drawn out to a needle-point, with its base inserted tightly in the cotton plug. This method is best used where the nature of the specimen precludes its being held in place by the lateral glass walls without injury or distortion, as, for example, in those alate forms where the wings extend beyond the body margin, or in the case of mounted specimens where the legs so protrude. The specimen may be impaled upon the side by bending the needle into an elbow, or it may be placed in a direct line with the long axis of the pin by inserting the pin through the posterior end. By twisting minuten pins around the steel needle, so that they arise at right angles from it, an entire series may be mounted within a single tube.

In the case of wet mounts, it is perhaps more often desirable to suspend the specimen. Soft bodied specimens that assume any tortuousness or other irregularity of outline, densely setaceous larvae, or specimens whose appendages extend beyond the body wall, which can not be held in place by the glass walls without suffering distortion, should always be mounted in this way. It is important that the carrying tube should be of a diameter exceeding that of the specimen by at least one-half inch.

Here the glass rod fused onto the rim of the valve finds its greatest use. The rod should be tipped liberally with an adhesive and carefully inserted through the posterior end of the specimen. By exerting proper care in the selection of the diameter of the rod to be employed there will occur no distortion of anal structures. As minuten pins were attached as secondary branches of the steel needle in the dry mount described above so, too, may glass needle-points be attached by fusion as secondaries to the main rod. However, the type described, that of having the rod support the specimen by piercing the anus and extending well forward inside the body, is the most useful and will be the one most frequently employed. The many possible variations will become quite apparent to the technician as soon as the requisite dexterity is secured, and the need of a different type is demanded by the specimen at hand.

The specimens may be mounted in duplicate (normally quadruplicate) on cardboard strips, the strip being held in place by the glass walls, and the specimens being fastened upon it by means of a colorless and smearless adhesive, to exhibit dorsal, ventral, dextral, and sinistral aspects. This method is preferable to that of free insertion for the mounting of small, dry, fragile specimens, due to its minimizing the effect of all shock. It presents an effective display medium for educational purposes especially where the cardboard strips embody printed legends as to taxonomy, habitat, and other relevant data.

A slight modification is used where Microlepidoptera are to be mounted. The specimen, being spread and mounted with a minuten pin, is inserted into a celluloid strip in place of cardboard, in order to make visible the ventral as well as the dorsal aspects. Extreme care should be exercised in cutting the celluloid strips and in selecting the pins to be used. The strip must be sufficiently tight to lodge firmly in place once inserted, and yet it cannot be so tight that it will buckle. Its anterior end should be rounded in a manner to conform with the tube's end. The pins must clear the glass both above and below, for their movement would destroy the specimen in short time. It might be found desirable to extend this method to include the mounting of many types of dry specimens which are required to be at a distance from the walls.

The cardboard strip is not well adapted for alcohol mounts. It will be remembered that its use in dry mounts is of value (1) in making negligible the destruction suffered by the free insertion of small, brittle specimens, and (2) in providing suitable background for inconspicuous structures. Since the factor of brittleness is non-existent in fluid mounts, and since structures small enough to need the aid of background are also too small to allow of sufficient mucilage in alcohol, this method should not be used in alcohol mounts.

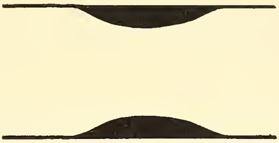
There is a single exception to this, namely, the life-history mount. In this instance the various stages of development, together with the host wherever possible, are fastened upon a single strip of glazed cardboard, and the relevant information is placed below each specimen. These life-history tubes find their greatest use in exhibition cases, and in display material of all kinds. For practical field purpose nothing can compete with the handiness of a single tube, small enough to carry in the vest-pocket, yet embodying all stages and host relationships of a species. However where institutions desire to adapt this system to their instructional material, and classroom requirements are primary, it is better to preserve each stage in a separate series of tubes. In this way single stages of the life history may be separately considered, or when desired, all may be presented together. In this way, also, the preparation of life-history series need not be delayed by the absence of one or more stages in the collection, but rather the entire teaching collection will be a potential group of life-history series.

In preserving all dry material, there is the ever-present danger of moisture escaping from the sealed specimen and subsequently condensing to cloud over the inside of the tube and render observation impossible. To cope with this, all specimens should be thoroughly dehydrated in absolute alcohol, and in the case of small specimens mounted in capillary tubes, where the ease of clouding is intensified, a drying agent, such as calcium chloride, should be incorporated within the mount as follows: Draw out one tube that has been constricted so that the bridge formed is of a diameter only slightly larger than that of the specimen. The walls should be drawn thin to give greater visibility, and the bridge should be long or short depending upon the number of individuals to be included. The constricted portion is filed to the desired length, and then sealed off, the specimens being placed within the narrow end thus formed, and separated off from the main tube by a small plug of cotton necked tightly into the shoulder area. The body of the tube behind the plug is then filled with calcium chloride up to within a short distance from the end, and the end is sealed over. The mount is inserted into a larger carrying tube after first wrapping the body of the first tube in cotton, and superimposing a label. The carrying tube is then sealed as usual.

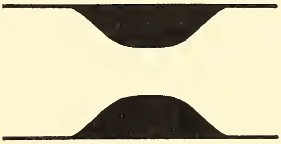
The preceding discussion setting forth the three main types of mounts has merely hinted at the possibilities that are available in the mounting procedure. There has been no attempt at a logical exhaustion of the potentialities implied in the principles of the technique; these alone, together with immediately relevant precautions, have constituted the foregoing discussion. It is believed, that equipped with these first principles, the adroit biologist will be able to mold them into conformity with his own particular laboratory, classroom, or museum requirements.

Miscellaneous Notes.

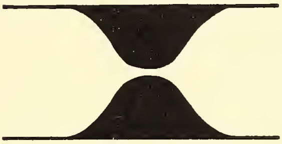
In the preparation of specimens where it is necessary to use glue or shellac, the writers have found the material known as rubber cement, a product commonly sold on the market, to be useful material in the laboratory. In fastening specimens to a background of cardboard or celluloid in alcohol mounts this material is highly useful because it is insoluble in alcohol and considerably cheaper than Murryite Cement commonly used. In the mounting of small specimens on cardboard points it is to be recommended because of its almost complete invisibility when applied. Even a sloppy mounting job appears well done because it is not apparent on the point, and if smeared on the insect the parts are not obscured. When the material has dried it leaves a transparent coating that may easily be removed. We have immersed entire insects in rubber cement and after drying, it is a simple task to remove the coating. Specimens of scale-covered snout beetles so treated did not lose their scales when the material was removed. Because of these properties it is a most useful material to employ when repairing insects whose heads, wings, or legs have been broken off. In the fastening of illustrations to cardboard, in the preparation of plates of illustrations for publications, rubber cement is greatly to be recommended, especially to beginners, because it adheres well, dries quickly and messy places where the material may run out from under the illustration may be more easily cleaned, than in the case with glue, by merely rubbing with a clean cloth or finger. Another use for rubber cement is as a label varnish where microscope slides are to marked with ink or wax crayon. A coating of rubber cement over the label is quite transparent and prevents the writing from being rubbed or erased. We have, in a small way, tested it as a protection for specimens from dermestids. Since insects that are completely encrusted with rubber cement are not injured by the coating and the parts are visible, we have placed a few specimens in vials with dermestid larvae and after



1



2



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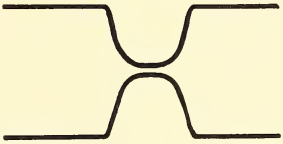

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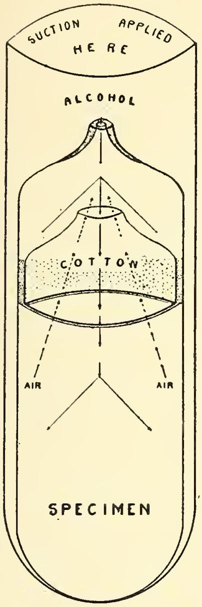
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HERE
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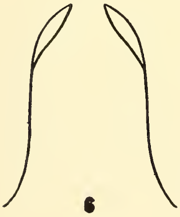
5



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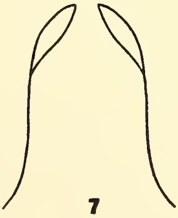

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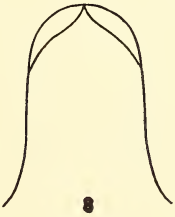

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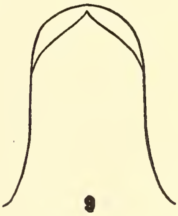

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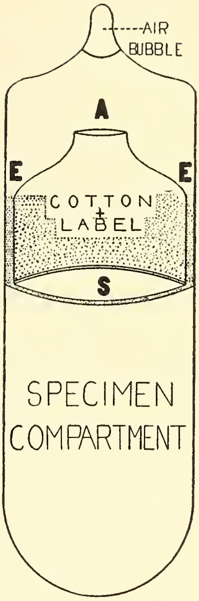
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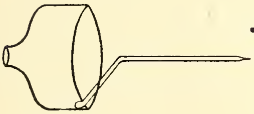
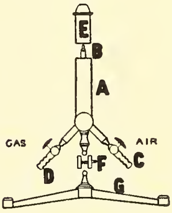


11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12

being so exposed for over a month were not infested by the dermestids.

In our laboratories we often recommend as a substitute for glass the use of microscope cover slips made of a clear grade of celluloid, what we call a "poor man's cover slip." These may be cut with scissors into round, square or oblong cover slips and used with such mounting media as balsam or euparol. Slides made with such cover slips have been kept now for four years without any deterioration. This type of cover slip may be used for dry mounts of such objects as insect wings, legs or antennae by fastening the cover slip to the slide by means of a gummed paper slide label which previously had a round or square space, as large as desired, cut out of the center of the label. The celluloid cover slip may be cut round or square and should be somewhat smaller than the gummed label whose edges should overlap the cover slip so that when moistened it will adhere to both the cover slip and the slide. Such dry mounts have the advantage of being readily accessible. By scraping the overlapping edges of the gummed label the specimens may be easily removed or turned over for examination, which is not possible with balsam or other permanent mounts. These, nevertheless, are as permanent a mount as balsam.

Explanation of Plate VI.

Figs. 1–3, Successive steps in the constriction process. Fig. 4, Tube drawn out (note thickness of walls). Fig. 5, Method of filling specimen tube with preservative. Suction results in the displacement of the air by the alcohol. Figs. 6–9, Successive steps in the final sealing of the tip. Fig. 10, Completed specimen tube. Fig. 11, Valve-rod used for suspending specimen in tube. Fig. 12, Blast lamp.

COLLECTING LEPIDOPTERA IN THE HEART OF NEW YORK CITY.

By Henry J. Dietz, New York City.

The writer's experience of collecting moths in some of the small parks in the lower, densely populated parts of New York City may be surprising and of interest to many entomologists.

Union Square Park, Madison Square Park and Bryant Park stand out for many specimens of a goodly number of species of Catocalae, obtained there during the seasons of 1905 to 1912.

On a morning in early August, 1905, I captured 18 specimens, all freshly emerged, of *Catocala palaeogama* and later in the same month 10 specimens of *C. relicta,* the latter comprising the various color forms of this beautiful species. The presence of *C. relicta* in Madison Square Park I connected with its favorite foodplant, silver poplar, *Populus alba.* I noticed that all the specimens encountered were resting on the bark of trees head up, not head down, as is the habit with most catocalae. It is one of the species occurring quite late in the season. Another peculiarity noted is, that I never found *C. relicta* resting on the trunks of white birch, as it should do in all fairness to the propagandists of protective coloration. Rather have I found it a conspicuous object, resting against a dark background.

C. cerogama, a feeder on basswood and linden, I caught in considerable numbers a few years later.

Altogether I have in my collection the following species of Catocalae, labelled and dated as caught in downtown New York City Parks:—*palaeogama, unyuga, vidua, basalis, ilia* and *relicta.* These records cannot be refuted, even by collector friends inclined to brand me as a sort of entomological Munchausen.

My observations on the occasional flights of southern butterflies, such as *Papilio cresphontes* and *Catopsilia eubule* in city parks must be accepted without the tangible evidence of captured specimens. Even if provided with a net, under the circumstances, I lacked in nerve to use in the face of certain ridicule and the possibility of arrest for causing the unlawful assemblage of a mob.

BOOK NOTES.

The Biology of Mayflies with a Systematic Account of the North American Species, by James G. Needham, Jay R. Traver and Yin-Chi Hsu, assisted by Specialists in Certain Subjects; pp. 1–xvi + 1–759, 1 colored plate, and plate of portraits, unnumbered; and plates I–XL, and text figures 1–168. (The Comstock Publishing Co., Ithaca, N. Y., $7.50.)

Here we have the book that every observer of the ways of nature plans to write some day, for his particular field. It is the ripe fruit of Dr. Needham's questing of Nature's secrets. Needless to say, an adequate review of such a work calls for a like expertness and knowledge. The writer is equipped with neither in the ephemerid field, so our readers must take the will for the deed; and accept only a factual statement of content.

This Biology naturally divides into two parts—the first, the biology proper; and the second a complete taxonomic survey of the species as they occur with us in North America, the nymphal stages also being included in this systematic account. There are numerous keys to the eggs, to the gills of *Ephemerella,* to families, to subfamilies, genera and species, throughout the work. The prefatorial note, as is usual courtesy, acknowledges aid received from many sources; but it also contains a paragraph, the implications of which will be discussed subsequently.

The Introduction surveys briefly the fundamental studies of mayflies by the older authors. The first chapter details the life of a mayfly, the common bandwing, *Callibaetis fluctuans,* from egg to adult. The following twelve chapters cover the structure and morphology of mayflies, adult and naiad. In the next three are considered mayfly phylogeny; casualties and enemies of mayflies; and the values and uses of these insects, both economic and educational. A chapter on collecting, preserving and rearing follows; and the final chapter of this part of the book relates to their classification.

The second part of the work—which is also the more extensive—contains the systematic account of the North American species in both adult and nymphal stages. There is a general bibliography of some 9 pages in length; and appended to Chapters XI and XII are special bibliographies on thoracic structures. The complete Index fills ten pages. There are 40 plates in black of structures of certain of the species, with one colored plate and one black plate of portraits, of five of the founders of the study of ephemerids (the last two are not numbered); plus 168 text figures. A very useful part of the work are the "Verification Tables" scattered throughout, as a character-check on the keys.

This is altogether a most significant landmark in the knowledge of the insect fauna of North America. Dr. Needham and his coauthors merit the gratitude of all students of insects, their development, habits and classification.

We indicated in our opening remarks that we would revert to a significant statement in the prefatory remarks by Dr. Needham himself. This is it: "As senior author I wish to assume responsibility for the omission from the text of names of first describers after the names of species. These are no part of the names of species. They are retained only where needed for systematic reference. Where so retained, I omit also the parentheses now commonly used to indicate the shift of a species from the original genus. For me, a name is a name, and not an historical sign board." To those familiar with Dr. Needham's iconoclastic and forthright views on nomenclature, this is no news. If other entomologists would condescend to become literate on these points, a very general chorus of protests would arise to join in his. We must, of course, except the adepts in (and addicts to) linguistics and archeology. They would naturally emit sundry sour notes. But after all, let us ask ourselves this: What *is* the purpose of entomology? The knowledge of insects in all phases? Classic Latinity? Or bibliographic research into musty ancient tomes as to who said which and what in the baptizing of newly discovered forms? No matter how much you atomize perfume on it, *Cimex lectularius* still has an evil odor; and no matter what you call it, it still bites! *Ars longa, vita brevis.* If, like questing terriers, we poke out noses into every smelly cranny, we will never chase down the game! If, as once was suggested, we got away from the nomenclatorial maze (I almost said *mess*), and numbered insects instead of naming them, what a howl would arise from the crusted semi-servile conservatives! On the other hand, if we compromised and instead of saying (or writing) *Callibaetis 1,* we called it *Callibaetis prima,* it would most assuredly be acceptable to the keenest linguistic and nomenclatural sharp. And naturally, we could then endlessly run down the line to *C. vigentimilla;* and everybody would be happy. Of course, this is ridiculous! The writer knows it. But every geometrician among our readers has a name for it.

After all, a name is only a convenient shorthand to distinguish one entity from another in our communications about it. So, as the Latins had it: *Stet.*

J. R. T.-B.

EDITORIAL

WE WEEP!

We have, for dark purposes of our own, been perusing Dr. Curran's *North American Diptera*; and from this editor's standpoint—we being in sweet ignorance on the fine points of Dipterology—we understood the plain language of the Bibliography. From this we gathered that there is no medium of publication for monographic work on American insects. We have been assuming all along, for ten years, that ENTOMOLOGICA AMERICANA was just that! And we further found that ENTOMOLOGICA AMERICANA was an irregular publication! We had somehow been under the impression that we were issuing four numbers a year with very fair regularity—you have to, if your journal is entered as Second Class Matter in the U. S. Post Office.

These two statements in a book so widely used as Dr. Curran's certainly do not benefit our publication to any degree; and this mild protest will reach but few of the readers of North American Diptera. But, at any rate, we are on record.

J. R. T.-B.

HEAVY, HEAVY SCIENCE.

In a letter to the editor of the London *Times,* nerve center of British indignation, Francis D. Acland quotes from an unnamed technical writer the subjoined sentence:

It would appear from what evidence is available that the act of oviposition is immediately stimulated by the crepuscular diminution in the intensity of illumination and the rise in relative humidity as the diurnal temperature decreases.

Out of this muddy mass of thirty-six words Mr. Acland manages an excellent translation in a dozen: "Egg-laying seems to be stimulated by twilight and the dampness of evening." The writer of the technical jargon quoted above was *writing about a moth,* but that seems insufficient excuse for the horrible pseudo-English that he produced. In many instances scientific writers have as an excuse the fact that a long, jaw-breaking word has the one meaning that must be conveyed, but perhaps a great many of them are as susceptible to exposure as the author of the sentence about the moth. —N. Y. Sun, 2–18–36.

PROCEEDINGS OF THE SOCIETY.

Meeting of November 14, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, November 14, 1935, at 8.00 p. m.

President Davis in the Chair and six other members present, *viz.,* Messrs. Cleff, Engelhardt, McElvare, Sheridan, Shoemaker and Siepmann, and Messrs. Crowe, Dietrich, Dietz, Farrelly, Halbert, Fisco, Kislink, Lubell, Pollard, Ptacek, and Stecher, Dr. Proctor, and Miss Dietz, Mrs. Kislink, Miss O'Connor and Mrs. Shoemaker.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported briefly as Treasurer, and read abstracts from a letter from Mr. Torre-Bueno.

Mr. William T. Davis stated that yesterday, November 13, was the last of nineteen consecutive warm days and the temperature reached 68 degrees. There were many butterflies near the docks at Tompkinsville, Staten Island, most of them *Colias eurytheme.* A few years ago this was an uncommon butterfly on the Island but is now one of the most plentiful. There were but two *Colias philodice* seen; a small Monarch butterfly that visited many of the clusters of seed heads of golden rods in search of flowers which it didn't find, and also two *Junonia coenia* or Buck-Eye butterflies that were found close together and flying but feebly. These were collected.

Mr. Shoemaker exhibited his collection of *Catocalas* from the Bronx Park, collected during the past several years. The material was beautifully mounted and labelled, and comprised 27 species and 9 forms. Mr. Shoemaker commented upon the relative abundance of the various species in the park, the approximate number of specimens seen being as follows:

Catocala innubens.. (2)
    form *scintillans.* (1)
C. piatrix. (2)
C. epione. (12)
C. antinympha. (5)
C. habilis. (12)
C. flebilis. (10)
C. residua. (3). Rare in Bronx Park, though generally
    not rare elsewhere.

C. retecta. 84 last year; one this year, none in previous years.
C. dejecta. 7 last year, one this year.
C. vidua. (4)
C. palaeogama. The commonest species in the Bronx Park. On some days one sees a couple of hundred.
  form *annida.* (50)
  form *phalanga.* (10)
C. subnata. (25)
C. neogama. (3)
C. ilia. The second commonest species in the Bronx Park. Several hundred specimens seen; often six or seven on a tree.
  form *conspicua.* (30 or 40)
  form *confusa.* (4)
C. cerogama. (20)
C. relicta. (2)
  form *clara.* (3)
C. parta. (20)
C. grotiana. Only one specimen seen during all the years collected there.
C. meskei. (8). Two this year, six last year, none seen in previous years.
C. unijuga. (15)
C. amatrix. (12)
C. andromedae. (*tristis*) (6)
C. coccinata. Scarce; one taken in 1923 and another July 1935.
C. ultronia. (3)
  form *lucinda.* (2)
  form *celia.* (2)
C. amica. (around 200). Occurs by dozens.
C. amica variety. (30)
Euparthenos nubilis. (4)
Allotria elonympha. (2)

In 1934 Mr. Shoemaker made his first trip to Bronx Park on July 16; in 1935 on July 11. This year, Mr. Shoemaker said, he had noticed that many of the *Catocalas* had little pieces nipped out of the wing, as if it were done by a bat. Mr. Engelhardt said that this was very likely the work of bats, as *Catocalas* are very slow fliers at night.

Mr. Pollard spoke on the subject of *Observations on the Gypsy Moth in Southern Maine.* In the vicinity of Denmark, Maine, this moth is very common and is rapidly becoming a serious pest. Mr. Pollard was surprised to find that in this region it feeds exclusively upon grey birch, with only a few scattered specimens on the white or canoe birch. In Massachusetts, however, where the moth was first introduced, it feeds upon almost every forest tree. Mr. Pollard also noted that the larvae, when they are ready to pupate, have adopted the habit of clustering on the triangular patches on the trunks of the birch trees, about eighty to a hundred in a group. The cocoons are spun in masses; they are tenuous affairs with only a few casual strands of silk to hold them together. This cocoon offers little protection to the pupa inside, and it seems to make no difference whether the pupa is removed from the cocoon, as moths will emerge from pupae which have been taken from their cocoons. The male and female pupae are readily distinguished by their difference in size. The male pupae are more numerous, and outnumber the females two to one. The adult males fly continuously during the daytime, but do not fly at night; they differ in this respect from most of our day-flying moths, which fly also at night. The female moth does not fly; she crawls to a comfortable spot on a tree and stays there permanently. Though she has strong wings she has lost the power of flight completely, and if tossed into the air, will fall to the ground like a plummet without even an attempt to flutter. There is a tendency in this family of moths to lose the power of flight in the female; in some of the species the female is wingless. The eggs are laid in a dense mass, cemented with a gummy material like varnish, which is impervious to the weather, and probably keeps out all parasites as well. The Gypsy Moth mates only once; the male then dies, and the female begins to lay eggs after 24 hours. The young larvae are not social; nor do the caterpillars travel to pupate. Since the females cannot fly, the question arose: How does this species spread? Mr. Pollard said that about the only way it could spread was by the larvae crawling from tree to tree in search of food. According to Mr. Pollard, in this country the moth is smaller in size than in Europe, the males, especially, being small.

Mr. Dietrich said that there had been some spraying for the Gypsy Moth in Pelham Park, N. Y., during the past summer.

Mr. Engelhardt told of his visit to Maine during July. Several days at Bar Harbor were devoted to outings, kindly provided by Dr. A. E. Brower, in charge of the Entomological Laboratory and by Mr. William Proctor, well known for his biological surveys of the Island of Mount Desert. This island is famous for its picturesque scenery of mountains, lakes and bays along a rugged coast. An inspection trip with Dr. Brower afforded opportunities of getting acquainted with inland sections of the State, including a visit to the Agricultural College at Orono and a week end on Mount Katahdin. Lumbering, the most important industry of Maine in the past, has left its imprints everywhere. Virgin stands of timber now are limited to regions difficult of access. The present forests, although still very extensive, represent largely second and third growths, suitable chiefly for pulp wood, of which the short, peeled cuttings choke lakes and streams leading to mills. Nature abused is bound to be followed by evil consequences. There have been forest fires of great destruction and insect pests and plant diseases call for constant attention on the part of the men trained in the forest service. The forest tent caterpillar, *Malacosoma disstria,* in localized districts, is taking a toll amounting to the defoliation of hundreds of acres of deciduous trees; conifers are subjected to the attacks of bark beetles, sawflies, gall forming aphids, etc. In a fine grove of beeches the trees were found dying from a blight, the nature of which is still under investigation. Driving along the highway a scarcity of butterflies and other insects was noted. Only in places abounding in flowering plants, such as dogbane and wild sarsaparilla did they congregate in numbers. Mount Katahdin, since its incorporation as a State Park and Game Preserve, has been rendered easy of access by the construction of roads connecting with trails at the base of the mountain. Mr. Engelhardt approached by way of Togue Pond, parking the car at Depot Camp on the northeastern slope and packing in only two days supply of food, as they had obtained reservation of bunks and blankets at the Dudley log cabin, six miles by trail to Chimney Pond. Here the mountain forms an imposing cirque with Chimney Pond and Dudley's Camp at the bottom of a semicircle facing precipitous walls 2000 feet high. Their first ascent, at noon, July 13, was made over the short saddle trail, only three miles, yet two hours of tough climbing. On the morning of the next day they took the longer and harder Dudley Trail, which after Pamola Peak follows the very rim of the cirque, known as the Knife Edge, for in places it is only one or two feet wide, with stupendous chasms on either side. The highest point is reached at Baxter Peak, elevation 5267 feet. Weather conditions were fair. Storm clouds interspersed with sunshine; strong winds, but no rain. Insects, fairly common during sunshine on the high, boulder strewn parts of the mountain, it was noted, represented largely migration flights from lower elevations. True alpine species have their haunts in the above timber line meadows extending for several miles along the western slope at about 4500 feet. Here is the home of the butterfly *Oeneis katahdin,* considered a valid species, restricted in its habitat to this mountain. A fine, long series secured strongly suggests a close relationship to *Oeneis semidea* found above timber line in the neighboring White Mountains. The view from Mount Katahdin is of surpassing beauty provided weather conditions are favorable. Range after range of wooded mountains stretch far into the horizon. In between are hundreds of lakes, glistening like mirrors in the late afternoon sun. However, only too often one encounters only clouds and rain.

Mr. Proctor spoke of the excellence of Mt. Desert Island, Maine, as a collecting ground for entomologists. Many species of insects, as in the Tipulidae, for example, occur on Mt. Desert Island at an elevation of 800 to 1,300 feet which would be found elsewhere in Maine or in the White Mountains only on the tops of mountains at much higher elevations. Another peculiarity of the island is that a great many species of insects are found there, but many of them have a decidedly local distribution for so small a place, being found in one particular part of the island and not elsewhere. Many stray species occur, which are not found on the mainland near by. The collector can go from one place to the next on the island, and get an entirely new line of insects. Mr. Proctor highly recommended this locality to the entomologist, especially where close collecting in some particular family is intended, and said that many quite unexpected things can be turned up. Mr. Proctor said that he had used lights for collecting and had satisfactory results. He generally used the ordinary electric light bulbs, but recently tried the blue bulbs which are recommended for this purpose. With the blue lamps he obtained many species which did not come to the ordinary type of lamp. One of the best ways to get beetles, Mr. Proctor said, was to wrap up a cantaloupe loosely in some brown wrapping paper and let it remain outside for two days. In reply to a suggestion that the difference in the insects found in different parts of the island might be due to the soil, Mr. Proctor said that the island was mostly granite. Most of the woods are coniferous, and the difference in the type of forest offers no explanation either.

The meeting adjourned at 10:55 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF DECEMBER 12, 1935.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, December 12, 1935, at 8:15 p. m.

President William T. Davis in the chair and eight other members present, *viz.:* Dr. Proctor, and Messrs. Cleff, Engelhardt, McElvare, Sheridan, Shoemaker, Siepmann and Wilford, and Messrs. Noah Bower, Henry Dietrich, Henry J. Dietz, Merman J. Erb, James J. Farrelly, Jr., Richard Fisco, Ira M. Friedland, Sidney A. Hassel and Hans L. Stecher, and Miss Dietz, Mrs. Shoemaker, Mrs. Dietrich and a reporter from the *Brooklyn Daily Eagle.*

The minutes of the previous meeting were read and approved. The secretary showed the two loose-leaf notebooks which contain the minutes and reports of the Treasurer and of the Publication Committee from January, 1931, to December, 1935. Mr. Engelhardt presented a brief Treasurer's report, and read excerpts from a letter from Mr. Torre-Bueno.

Mr. Engelhardt proposed for membership Dr. William Proctor, 430 Park Avenue, New York, New York, who was duly elected a member.

Mr. Davis appointed a nominating committee, to consist of Messrs. Sheridan, Wilford and Cleff. Mr. Davis also reported that the society's new Certificate of Incorporation had been signed by Judge Norton and was now in Albany awaiting approval.

Mr. Brower reported that he had taken three specimens of *Dasymutilla vesta* var. *sappho* at Lakehurst, N. J., and that the previous most northerly record was North Carolina.

A specimen of the cicada, *Tibicen lyricen* with an anchor-shaped mark on the pronotum was exhibited by Mr. Davis. The specimen was taken by Mr. Dietrich at Pelham Bay Park, July, 1935. This form is very common in the Piedmont highland regions, but is very rare locally.

Mr. Richard Fisco exhibited specimens of beetles of the families *Scarabaeidae, Cerambycidae* and *Lucanidae.*

Mr. Dietz presented a paper on collecting Catocalas and other Lepidoptera in the Bronx Park. He especially collected among the hemlocks in the sunken meadows at the northern end of the Botanical Garden. *Catocala palaeogama* was a very common species, there often being as many as six on a tree, especially on hemlock.

Mr. Engelhardt presented a paper on "The Desert in Bloom," published separately in the BULLETIN. Specimens of the insects collected, including some *Cleridae* bred from mistletoe, as well as photographs and post-card views of the region were shown. The extreme effects of the desert environment were particularly noticeable in the clearwing moths of the genus *Xenodoxus*.

Mr. Davis exhibited specimens of the Cicada, *Diceroprocta swalei,* and the variety *castanea* Davis. The variety *castanea* occurs mainly in the Santa Rita Mountains, Arizona, but all the specimens he had seen from other localities, as San Capitan, etc., were typical specimens and not *castanea.*

The meeting adjourned at 10:05 p. m.

Carl Geo. Siepmann,
Secretary.

Meeting of January 16, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 16, 1936, at 8:10 p. m.

President William T. Davis in the chair and seven other members present, namely, Messrs, Dietz, Engelhardt, Kaiser, McElvare, Sheridan, Siepmann and Willford; also Miss Dietz, and Messrs. Peter Crowe, Henry Dietrich, Richard Fisco, Werner Marchand, Joseph Ptacek and Hans L. Stecher.

The minutes of the previous meeting were read and approved. An article from the *Brooklyn Daily Eagle* was read by the sercetary and placed on file.

An annual report for 1935 and a detailed account of receipts and expenditures for 1935 was presented by the Treasurer and ordered placed on file.

Mr. Davis commented upon Mr. Engelhardt's good work as Treasurer and said that the society was greatly indebted to him for handling its affairs so well in these trying times.

Mr. Engelhardt next read the Annual Report of the Publication Committee, which was ordered placed on file.

Mr. Sheridan proposed that the society give a vote of appreciation and thanks to the Treasurer, Mr. Engelhardt, and to the editor, Mr. Torre-Bueno, for their excellent work. The motion was seconded and unanimously carried.

Mr. Engelhardt said that the society should try to arrange occasional programs of general entomological interest to invite the attendance of amateur and non-technical entomologists. The subject of encouraging beginners and young collectors to attend the meetings was next discussed by those present, Mr. Wilford suggesting some sort of a junior membership.

Mr. Sheridan reported for the Nominating Committee, and recommended the reëlection of the existing officers, as follows:

(Continued in October Number.)

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

WILL COLLECT for cash all ORDERS OF INSECTS, providing I receive sufficient orders prior to collecting to justify my proceeding. Have many specimens in stock at all times for sale. Louise Knobel, Hope, Arkansas.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

FOR SALE.—Indian butterflies, Moths, Sphingidae, Beetles, living Cocoons, etc. For particulars write to The Himalayan Butterfly Co., Shillong, Assam, India.

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BULLETIN

OF THE

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SMITHSONIAN INSTITUTION
OCT 13 1936
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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXI October, 1936 No. 4

SUGGESTIONS FOR A NEW INTERPRETATION OF THE POSTABDOMEN IN MALE CYCLORRHAPHOUS DIPTERA.

By G. C. Crampton, Massachusetts State College, Amherst, Mass.

A study of the terminal abdominal segments of male Cyclorrhapha has indicated that the generally accepted views concerning the interpretation of the segments of the postabdomen of these Diptera need revising. A detailed discussion of the terminalia of male Cyclorrhapha in general will be published elsewhere, but the main points brought out by this study may be briefly indicated here.

The normal relation of the sternites to the tergites in the postabdomen of one of the Nematocera in which there is no torsion of the terminal abdominal segments, is illustrated by the bibionid *Dilophus* shown in Fig. 1. The spiracles of the eighth abdominal segment are atrophied in this bibionid, the last pair of abdominal spiracles being those of the seventh segment—as is typical of male Diptera in general. The eighth abdominal sternite *8s* is considerably enlarged in the bibionid shown in Fig. 1, and this condition persists in the higher Diptera, since the inverted eighth abdominal sternite is usually the largest pregenital sternite of the postabdomen of male Cyclorrhapha.

The Orthorrhapha Brachycera occupy a position intermediate between the Nematocera and the Cyclorrhapha, and some of them, such as the dolichopodid *Argyra* shown in Fig. 2, illustrate a stage in the development of the cyclorrhaphous type of male terminalia. Thus in the dolichopodid shown in Fig. 2, the ninth segment *9t* has undergone a complete circumversion, and the eighth sternite *8s* has become drawn up into the insect's left side, although the eighth sternite is not completely inverted in the dolichopodid shown in Fig. 2, as it is in typical male Cyclorrhapha. The seventh sternite

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is not "lateroverted" (or displaced into the insect's left side) in the dolichopodid shown in Fig. 2, as it is in male Cyclorrhapha, but the fifth abdominal sternite *5s* is "cleft" posteriorly in this dolichopodid, as it is in many muscoid flies.

The Syrphidae occupy a position at the base of the lines of descent of the Cyclorrhapha in general, and some Syrphidae, such as *Sericomyia chrysotoxoides,* illustrate the beginnings of the modifications characteristic of the higher Cyclorrhapha, since the ninth abdominal segment of *Sericomyia* is twisted about, and the eighth sternite is almost completely inverted, while the seventh sternite is slightly displaced into the insect's left side, but the seventh sternite is not united with the inverted eighth sternite in *Sericomyia.*

In a higher syrphid such as *Paragus tibialis,* the seventh sternite becomes more pronouncedly displaced into the insect's left side than it is in the lower syrphids, but the seventh sternite is still distinct from the inverted eighth sternite in *Paragus tibialis.* In the other species of *Paragus,* however, (as in the case in *Paragus bicolor,* shown in Fig. 3) the lateroverted seventh sternite *7s* unites with the inverted eighth sternite *8s,* and the two sternites are separated only by a faint incomplete suture.

The sixth sternite *6s* is asymmetrically developed in the higher syrphid shown in Fig. 3, being well developed only in the insect's left side—as is also the case in the higher Cyclorrhapha next to be considered. The fifth sternite *5s* is narrowed mesally in this syrphid, and is developed only laterally (on each side) thus suggesting the beginning of the formation of the bilobed fifth sternite typical of male muscoid flies.

The higher Syrphidae thus presage, so to speak, the modifications of the terminal abdominal segments characteristic of the higher Cyclorrhapha, and such features as the asymmetrically developed sixth sternite *6s,* the united lateroverted seventh sternite *7s* and inverted eighth sternite *8s,* etc., of the higher syrphid in Fig. 3, are strikingly suggestive of the modifications of the corresponding sternites in the higher Cyclorrhapha shown in Figs. 4 and 6.

In the helomyzid *Neoleria crassipes* shown in Fig. 4, the relation of the parts of the postabdomen to each other clearly indicates a modification in the direction of the development of the parts characteristic of typical male muscoid Diptera, but the parts remain in a more primitive condition in this helomyzid than is the case in typical muscoid flies, and it is an easy matter to compare the sixth, seventh and eighth sternites (bearing the labels *6s, 7s* and *8s* in

Fig. 4) of *Neoleria*, with the corresponding sternites in such a syrphid as the one shown in Fig. 3.

In the helomyzid shown in Fig. 4, the ninth segment *9t* (together with the proctiger, or anus-bearing terminal region) has undergone a complete circumversion in a clockwise direction (as the insect is viewed from behind), as is typical of the Cyclorrhapha in general, in which the circumversion of the parts is indicated by a looping up of the vas deferens, or ejaculatory duct, over the top of the hindgut before it discharges through the ventrally located intromittent organ of the male. The rotated ninth segment projects more directly backward in *Neoleria* (and in the higher Cyclorrhapha in general) than it does in the syrphid shown in Fig. 3, in which the ninth segment is twisted about, and projects laterally, instead of projecting more rigidly backward.

The eighth sternite *8s* is completely inverted in the helomyzid shown in Fig. 4, as in the case in the higher Cyclorrhapha in general. The seventh sternite *7s* is lateroverted, or is drawn up into the insect's left side, in *Neoleria*, but the seventh sternite is merely attached by one corner to the inverted eighth sternite, instead of being broadly joined to the latter, in this helomyzid.

The sixth sternite *6s* is asymmetrical (being well developed only in the insect's left side) in the helomyzid shown in Fig. 4, and the sixth sternite has become attached by one corner to the lateroverted seventh sternite *7s*, as the asymmetrical sixth sternite tends to do in the muscoid flies and their relatives. The sixth sternite *6s*, however, retains its normal relation to the reduced sixth tergite *6t* in *Neoleria*, and it is an easy matter to compare the sixth, seventh and eighth sternites of the helomyzid shown in Fig. 4, with the corresponding parts in a more primitive cyclorrhaphan, such as the syrphid shown in Fig. 3, or with a more specialized cyclorrhaphan, such as the anthomyiid shown in Fig. 6.

In the anthomyiid *Hylemyia antiqua* shown in Fig. 6, the parts of the postabdomen have become more closely united than is the case in the helomyzid shown in Fig. 4, but it is very easy to compare the asymmetrical sixth sternite *6s*, the lateroverted seventh sternite *7s*, the inverted eighth sternite *8s*, and the reduced sixth tergite *6t*, of the anthomyiid shown in Fig. 6, with the corresponding parts of the helomyzid shown in Fig. 4.

The ninth segment *9t* (together with the proctiger) has undergone a complete circumversion in *Hylemyia*, as is indicated by a looping up of the vas deferens, etc., over the top of the hindgut, and the same is true of the Cyclorrhapha in general.

The lateroverted seventh sternite, *7s*, has united with the inverted eighth sternite, *8s*, in the anthomyiid shown in Fig. 6, but the two sternites are separated by an incomplete suture in this insect. The size of the demarked area of the seventh sternite in Fig. 6, indicates that the seventh sternite undergoes considerable reduction in uniting with the inverted eighth sternite in the anthomyiids and in the muscoid Diptera in general. The area labelled *7s* in Fig. 6 bears the left spiracle of the seventh abdominal segment, and since the spiracles are typically located in the tergites in the muscoid flies, it is evident that a small upper portion of the region labelled *7s* in Fig. 6 is formed by the vestigial tergite of the seventh abdominal segment.

The sixth sternite *6s* is asymmetrically developed in the anthomyiid shown in Fig. 6, and the sixth sternite forms a slender transverse band bordering the genital pouch (into which the aedeagus is thrust in repose) in this insect, as is also the case in the muscoid flies in general. The sixth sternite is attached by one corner to the area representing the lateroverted seventh sternite *7s* in the anthomyiid shown in Fig. 6 (as is characteristic of the muscoid flies in general), and the sixth sternite is frequently mistaken for the eighth sternite in the higher Cyclorrhapha, although the sixth sternite *6s* is situated below the reduced sixth tergite *6t* in Fig. 6, and the spiracle of the sixth abdominal segment lies in the membrane between the sixth tergite and the narrow sclerite in question, as would be expected if this sclerite represents the sixth sternite in these insects.

The fifth sternite *5s* is bilobed in *Hylemyia,* as it is in typical muscoid flies (although the fifth sternite is not bilobed in the helomyzid shown in Fig. 4), and the fifth tergite *5t* is well developed and forms the last tergite of the preabdomen in *Hylemyia,* as is typical of the Muscoidea in general.

The modifications of the sixth, seventh and eighth sternites, bearing the labels *6s, 7s* and *8s* in the anthomyiid shown in Fig. 6, represent a condition intermediate between that exhibited by the corresponding parts in the helomyzid shown in Fig. 4, and those of the calliphorid fly shown in Fig. 5, which has been selected to illustrate the parts of the male terminalia in a typical muscoid fly.

In the calliphorid *Phormia regina* shown in Fig. 5, and in the Muscoidea in general, the ninth segment *9t* (together with the proctiger, or anus-bearing terminal region) has undergone a complete circumversion, as is indicated by a looping up of the vas deferens over the top of the hindgut.

In the Sarcophagidae and related flies, the ninth segment is usually referred to as the "second genital segment," while the segmental complex bearing the label *7s* + *8s* in Fig. 5, is usually called the "first genital segment" by the students of the Sarcophagidae and related flies. The so-called first genital "segment," however, is a segmental complex largely composed of the lateroverted seventh sternite and the inverted eighth sternite, as may be seen by comparing the region bearing the label *7s* + *8s* in Fig. 5, with the parts bearing the labels *7s* and *8s* in Figs. 6, 4 and 3; and the position of the spiracles will also aid in comparing the parts in these flies.

The sclerite bearing the label *7s* + *8s* in Fig. 5 is regarded as a "tergite" by everyone who has attempted to identify it in the muscoid flies, and even in Snodgrass' recent "Principles of Insect Morphology" it is referred to as the eighth tergite in these flies, while the sixth sternite, labelled *6s* in Fig. 5, is regarded as the true eighth sternite by Snodgrass. If, however, the crevice between the lateroverted seventh sternite *7s* and the inverted eighth sternite *8s* of Fig. 4 were to become closed, a condition like that shown in Fig. 6 would result, and if the suture between the lateroverted seventh sternite *7s* and the inverted eighth sternite *8s* in Fig. 6 were to drop out, a condition like that shown in Fig. 5 would result, so that by tracing the parts from Fig. 5 to Fig. 6, and on back through Fig. 4 to Fig. 3, etc., it is readily seen that the structure regarded as a pregenital "tergite" in such a muscoid fly as the one shown in Fig. 5, is in reality a composite region composed of the seventh and eighth sternites, which become drawn up into the dorsal region when the ninth segment undergoes a circumversion.

The validity of the claim that the seventh sternite becomes drawn up into the insect's left side, and that the eighth sternite becomes inverted when a circumversion of the ninth segment takes place, rests wholly upon the assumption that the torsion of the parts of the postabdomen has taken place in a clockwise direction (i.e., from left to right, as the insect is viewed from behind), since a torsion in the opposite direction would produce a wholly different arrangement of the parts from that described above. There is abundant proof that the torsion has taken place in a clockwise direction in the Cyclorrhapha, however, since the looping-up of the vas deferens over the top of the hindgut always takes place from left to right, indicating that the torsion of the parts has been from left to right in every case. Schraeder, 1927, has observed such a circumversion of the terminalia in the pupal stage of the typical muscoid fly *Calliphora,* in which the arrangement of the parts is exactly like that occurring in the rest of the Muscoidea and their relatives, and the natural inference is that such a circumversion of the terminalia takes place in the pupal stages of the Cyclorrhapha in general. Furthermore, it is easy to trace the clockwise torsion of the parts in a series of Syrphidae, and since the sternites of such a syrphid as the one shown in Fig. 3 are clearly homologous with the sternites bearing the same labels in the series of flies shown in Figs. 4, 6 and 5, it is evident that the interpretation of the parts proposed above is fully supported by all of the available evidence.

The fact that the sixth sternite *6s* of the calliphorid fly shown in Fig. 5 is attached by one corner to the supposed eighth "tergite," bearing the label *7s* + *8s* in Fig. 5, has caused some investigators to interpret it as the "eighth" sternite in the muscoid flies. The evidence of comparative anatomy, however, clearly supports the view that the sclerites bearing the labels *6t* and *6s* in the calliphorid shown in Fig. 5 represent the tergite and sternite of the sixth abdominal segment, as may be seen by tracing the parts in the series of flies shown in Figs. 5, 6, 4 and 3, which lead back to the lower syrphid types in which the tergite and sternite of the sixth abdominal segment are normally developed. The sixth sternite *6s* is asymmetrical in the calliphorid shown in Fig. 5, being well developed only in the insect's left side, as is also the case with the sixth sternite in the anthomyiid shown in Fig. 6 (compare also Figs. 4 and 3) ; and the narrow sixth sternite forms a stiffening border for the genital pouch in these flies.

The fifth sternite *5s,* or last sternite of the preabdomen, is bilobed posteriorly in *Phormia,* and this condition is typical of the muscoid flies in general. The fifth tergite *5t* is large in *Phormia,* and forms the last tergite of the preabdomen, as it does in the muscoid flies, in which the fifth tergite is the last "visible" tergite of the abdomen. The fifth pair of spiracles is borne in the fifth tergite and serves to identify it when there is a fusion of the segments in the basal region of the abdomen.

A reduction in the segments of the abdomen takes place in various ways in the Cyclorrhapha. In the muscoid flies the first and second tergites frequently unite, but the composite basal tergite bears two pairs of spiracles in such cases, and the first two sternites usually remain distinct, so that it is usually possible to count the segments in the ventral region, when the basal tergites unite. The reduction of the segments of the postabdomen is usually brought about by the union of the seventh and eighth segments in the higher Cyclorrhapha, and the sixth tergite may becomes atrophied while the sixth sternite may unite with the seventh in some cases, and in some Cyclorrhapha other segments may drop out, etc.

The anus-bearing, non-segmental telson, and the cercus-bearing eleventh segment, apparently unite with the tenth abdominal segment, to form the proctiger, or anus-bearing segmental complex behind the ninth tergite *9t* of Figs. 5, 6, etc., which is usually referred to as the "tenth" segment alone by the students of the higher Diptera, even when they identify its appendages *ce* with the cerci of lower insects. The cerci, however, are appendages of the eleventh abdominal segment, and if the appendages of the anus-bearing terminal region represent true cerci (and these structures in the Diptera are evidently homologus with the structures generally interpreted as true cerci in the Mecoptera and their relatives) then the cercus-bearing eleventh abdominal segment must also enter into the composition of the terminal anus-bearing structure (or proctiger), and on this account, the latter cannot be interpreted as the tenth abdominal segment alone, as some investigators are inclined to believe.

The surstyli labelled *ss* in the higher Diptera shown in Figs. 3, 4, 5 and 6, are appendages of the ninth tergite *9t,* and should not be homologized with the parts of the male genital forceps labelled *cx* and *st* in a lower dipteron such as the one shown in Fig. 1, as is done by Awati, 1915, Hendel, 1928, Patton, 1932, and other students of the higher Diptera. It is not the surstyli *ss,* but rather the anterior and posterior gonapophyses labelled *a* and *b* in the higher Diptera shown in Figs. 5 and 6, that represent the segments of the genital forceps labelled *cx* and *st* in the lower dipteron shown in Fig. 1, as may be seen by comparing the corresponding parts in one of the lower representatives of the Cyclorrhapha, such as a syrphid, etc., with the parts in a bombyliid, leptid, and other lower forms leading back to the Nematocera.

The genital forceps bearing the labels *cx* and *st* in the lower dipteron shown in Fig. 1, are homologous with the parameres of male Hymenoptera, Coleoptera, etc., and if the structure labelled *a* and *b* in the higher Diptera shown in Figs. 5 and 6 are homologous with the parts labelled *cx* and *st* in Fig. 1, it is quite correct to designate the structures labelled *a* and *b* in Figs. 5 and 6, as the parameres also, as is done by Hendel, 1928, Patton, 1932, and other students of the higher Diptera, although these investigators apparently do not realize all that is implied in this interpretation, when they proceed to homologize the surstylii *ss* with the genital forceps of the lower Diptera, even when they interpret the anterior and posterior gonapophyses of the higher Diptera as parameres!

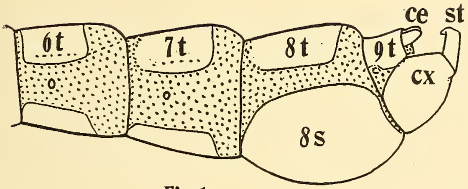
A more detailed comparison of the gonapophyses, etc., of the lower Cyclorrhapha, such as the Syrphidae, *etc.*, with the parts of the genital forceps of the Bombyliidae, Asilidae, Dolichopodidae, Empidae, Leptidae, and other forms leading back to the Nematocera, will be discussed in a later paper, since it is the purpose of the present discussion merely to present very briefly, the evidence for a new interpretation of the segmentation of the postabdomen of the higher Diptera, suggested by a recent study of the terminalia of male cyclorrhaphous Diptera.

ABBREVIATIONS USED IN PLATE.

a—Anterior gonapophysis (compare with *cx* of Fig. 1). *ae*—Aedeagus or phallosome. *b*—Posterior gonapophysis (compare with *st* of Fig. 1). *c*—Genital spine. *ce*—Cercus. *cx*—So-called "coxite" or basal segment of parameres. *s*—Sternite. *ss*—Surstyli. *st*—So-called "stylus" or distal segment of parameres. *t*—Tergite.

EXPLANATION OF PLATE VII.

Fig. 1.—A bibionid *Dilophus* sp. Fig. 2.—A dolichopodid *Argyra* sp. Fig. 3.—A syrphid *Paragus bicolor.* Fig. 4.—A helomyzid *Neoleria crassipes.* Fig. 5.—A calliphorid *Phormia regina.* Fig. 6.—An anthomyiid *Hylemyia antiqua.* All figures represent lateral views of the terminal abdominal structures of male insects.


6t
7t
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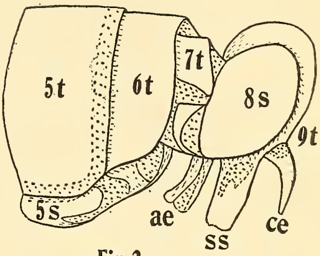
9t
ce
st
cx
8s

Fig. 1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ss
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Fig. 2

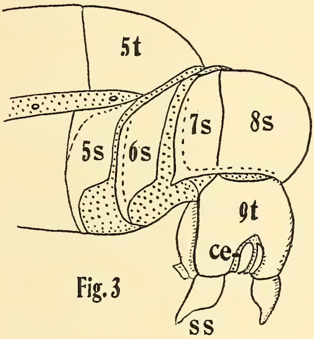
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Fig. 3

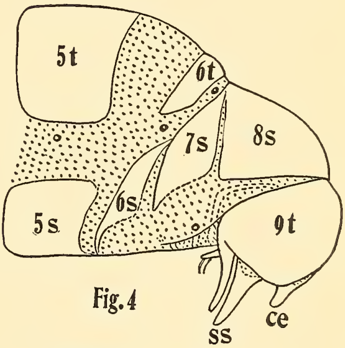
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Fig. 4

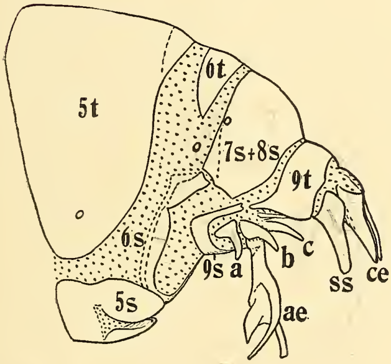
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Fig. 5

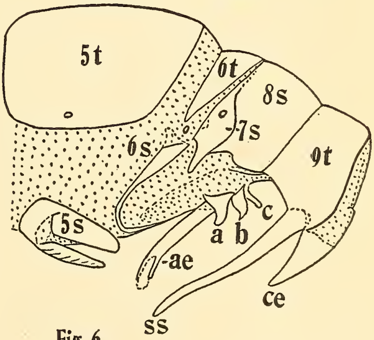
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Fig. 6

AN INTERESTING PTEROSTICHUS AND A NEW COLPODES FROM ARIZONA (COLEOPTERA: CARABIDAE)

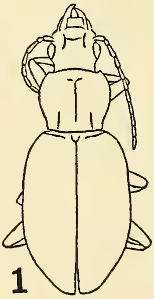
By P. J. Darlington, Jr., Museum of Comparative Zoölogy, Cambridge, Mass.

The following two fine species of Carabidae have been lent me for study by Mr. H. C. Fall. Both were taken in the Baboquivari Mts., extreme southern Arizona, about the middle of the state from east to west, by the late Mr. O. C. Poling.

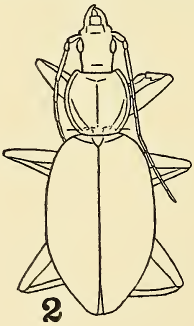
Pterostichus (Ithytolus) arizonicus Schffr. (fig. 1).

Schaeffer 1910, Sci. Bull. Mus. Brooklyn. Inst. Arts Sci. 1, 393.
Casey 1913, Memoirs 4, 129.

Redescription: Form as figured, moderately convex; brownish piceous, appendages slightly more rufescent; upper surface finely and lightly alutaceous, moderately shining. *Head* moderately elongate; eyes not very prominent; mandibles moderately elongate and arcuate, not striate, without bristle in scrobe; front with 2 strong, linear, slightly arcuate longitudinal impressions; 2 setae over each eye; ligula narrow basally, expanded at extreme apex, bisetose, not carinate; mentum tooth rather small, emarginate at apex; antennae moderate, 3rd segment (by measurement) about 3 times as long as greatest width, 2nd about one-half length 3rd, 1st slightly shorter than 3rd, somewhat stouter, first 3 segments glabrous, outer ones somewhat flattened; palpi moderately elongate, slender with subapical segment about equal to apical, bisetose in front. *Prothorax* with side margins fine, each with seta at base and



1



2

one-third from apex; no basal nor apical margins; single linear basal fovea each side; middle groove fine, transverse impressions practically obsolete; surface of disk moderately convex, not punctate, faintly transversely wrinkled near middle. *Elytra* with humeri moderate; humeral margin distinctly, though a little obtusely, angulate, not dentate; margin only faintly sinuate before apex (seen from above) but with strong internal plica; apices conjointly moderately rounded, sutural angles about right, not dentate; striae fine on disk, deeper apically, impunctate; no scutellar stria but an ocellate puncture at extreme base 2nd interval; intervals nearly flat on disk, without dorsal punctures. Metepisterna moderately elongate, much narrowed posteriorly; inner wings well developed. Prosternum margined at apex. Front of mesosternum and first ventral segment with light punctuation; lower surface otherwise impunctate. Middle and hind tibiae sulcate externally, rather spiny; first 3 segments middle and hind tarsi sulcate each side above; 4th tarsal segment not dilated, only slightly emarginate; tarsi sparsely pubescent above, first 4 joints middle and hind tarsi with rather densely pubescent soles. Male with front tarsi moderately dilated, segments not distinctly oblique, first 3 biseriately squamulose below; last vernal with 1 setigerous puncture each side near apex. Length 10; width 3.8 mm.

Arizona: Tucson (type, U. S. N. M.) and Baboquivari Mts. (Poling collector, collection H. C. Fall). My description has been drawn from the second specimen, which, however, I have compared with the type.

Schaeffer was seriously in error in referring this species to *Gastrellarius*. There is a certain superficial similarity, but *Gastrellarius* contains only species with vestigial inner wings (a character not of itself of much importance) and relatively short and broad metepisterna, with tarsi not pubescent above and middle of soles also naked, and with mentum tooth entire. There are other differences, but they need not be listed. Casey placed the species (which he evidently did not know) "provisionally" in *Leptoferonia*, but this is no more fortunate, for *Leptoferonia* is another group with short, broad metepisterna, and with tarsi naked above and on middle of soles, and has a very different appearance. In my opinion, *arizonicus* does not belong to any subgenus or group previously known from the United States, but to *Ithytolus* Bates (now called a subgenus of *Pterostichus*) of Guatemala and southern Mexico. *Arizonicus* has about the same appearance as the species of *Ithy-*

tolus, to judge from the figure of *I. anomalus* Bates in *Biologia* (Pl. 13, fig. 15), an appearance almost as suggestive of certain *Agoni* as of *Pterostichus.* The exceptionally strong internal fold of the elytra, the hairy tarsi, and the full inner wings agree with *Ithytolus.* On the other hand *arizonicus* lacks the broad 4th tarsal joint of typical *Ithytolus* and differs somewhat in other ways. Apparently only 3 specimens (2 species) of *Ithytolus* have been known all ♀♀. I have seen none.

Colpodes falli n. sp. (fig. 2).

Form as figured, moderately convex; dark blue above, slightly purplish, especially on elytra; lightly alutaceous, especially on elytra; lower surface and appendages piceous black. *Head* elongate; eyes not very prominent; 2 setae over each eye; front bi-impressed anteriorly; mentum tooth strong, rounded-acute; antennae very slender, 3rd segment 8 or 9 times long as wide. *Prothorax* with moderate, explanate side margins; seta each side at base but none anteriorly; basal foveae moderate, rounded; sides of disk (inside margin) slightly depressed from foveae to in front of middle; disk slightly convex, middle groove narrow but well impressed except at extreme base and apex; basal and apical transverse impressions less well defined; surface finely, transversely reticulate-wrinkled, lightly punctate in basal foveae. *Elytra* with humeri slightly narrowed, humeral marginal line obtusely angulate; side margins slightly sinuate near apex; apices not much produced, conjointly rather narrowly rounded; sutural angles finely denticulate; striae fine, very faintly punctulate; intervals nearly flat, 3rd 3-punctate, 1st puncture nearly on 3rd striae about 1/6 from base, 2nd and 3rd nearly on 2nd stria near middle and one-fourth from apex. Metepisterna elongate but not strongly so; inner wings apparently vestigial, possibly dimorphic. Tibiae strongly sulcate on outer edge; basal segment of front and first 3 segments of middle and hind tarsi rather strongly sulcate each side above; 4th segment all tarsi rather deeply emarginate, but with outer lobe no longer than inner. Male front tarsi narrowly dilated, first 4 segments biseriately squamulose; last ventral with 1 setigerous puncture each side near apex. Length 15; width 5.5 mm.

Type ♂, Baboquivari Mts., Arizona, April, 1924, Poling collector; unique, in collection H. C. Fall.

This is only the third *Colpodes* to be known north of Mexico, not counting *Anchomenus marginatus* Lec. (*cf.* Chaudoir, 1859, Ann. Soc. Ent. France 3 (7), 328), which seems out of place in this genus. From *C. longiceps* Schffr. (1910, Sci. Bull. Mus. Brooklyn Inst. Arts Sci. 1, 394; Casey, 1920, Memoirs 9, 29) of the Huachuca Mts., Arizona, *falli* differs (from description) in larger size, shallow rather than deeply elytral striae, less prominent eyes, noncordate prothorax, and in having 1 instead of 4 setae each side ♂ last ventral. *C. rufiventris* Van Dyke (1926, Pan-Pacific Ent. 2, 120) of Mt. Washington, Arizona (also known to me only from description) is nigropiceous with rufous elytral margins, and is only 10.5 mm. long. None of these species seems to be the same as any of the 150 or so species of Colpodes of Mexico and Central America. It is a characteristic of this great, nearly tropicopolitan genus that many of the species are flightless and confined to single mountains or isolated mountain ranges, as the Arizona species seem to be.

Termites and the Drought.—The present drought recalls my experience with termites during the drought of 1930. In 1929 I discovered termites in the wooden foundation of my home. They were alive and quite numerous in the places that I had torn open. In 1931, when I replaced the wooden portion of the foundation with concrete, I was very much surprised to find that there were no termites in the old galleries, nor was there evidence of any recent activity. I concluded, therefore, that the severe drought of the year before (1930) had played havoc with them. Since it is necessary for termites to have a moist subterranean environment, it is quite likely that periods of drought act as a natural check to their increase. Specimens taken about my premises have been identified by Mr. T. E. Snider as *Reticulitermes flavipes* Kohl, and it is quite likely that those referred to above are of the same species.—Phil Rau, Kirkwood, Mo.

THE INTERRELATIONSHIPS OF THE SPECIES OF THE GENUS LYCAENA FABRICIUS (LEPIDOPTERA, LYCAENIDAE).

By Alexander B. Klots, College of the City of New York.

Some years ago Dr. A. Glenn Richards, Jr., and the author began work together on a study of the male genitalia of the species of *Lycaena,* with the special purpose of finding our what these organs might show regarding the interrelationships of the species. Since then various changes of residence have prevented the completion of this study as a joint undertaking; the present writer has finally succeeded in bringing the task to a point of at least approximate completion.

Obviously to be of the greatest value, such a study could not be confined to the Nearctic species, although these constitute the major interest of the writer. Accordingly the majority of the species of the world have been included; it is believed that the small minority that were unobtainable are not of great phylogenetic significance.

The writer is greatly indebted to Dr. Richards, who contributed much of the material and made many of the dissections, to the American Museum of Natural History, to Cornell University and Mr. W. P. Comstock for the loan of specimens, to Dr. W. Schaus for his very kind gift of a specimen of the rare *L. pyrrhias* Godman & Salvin, and to Dr. J. McDunnough and Messrs. N. D. Riley and Foster H. Benjamin for aid in clearing up synonymic tangles. All of Dr. Richards' and the author's specimens have been deposited in the American Museum.

Structures of the Male Genitalia.

(see especially figs. 1, 2 & 8).

The genitalia of the species of *Lycaena* are of the conventional, rather specialized, Lycaenid type, differing strongly in the dorsal structures from most other butterflies. The homologies of these structures with the similarly located organs of the majority of other Lepidoptera are somewhat uncertain, and so the terms "labides" and "falces" have been used here. It is probable that the labides are developments of the tegumen, while the falces may represent modifications of the uncus; but careful comparative and embroyological studies should be made to determine these points.

The labides (*lab*), rounded, hairy lobes, are nearly always well developed, as are also the falces (*fal*), which are long, sharp, heavily chitinized and strongly curved. The tegumen (*teg*) evidently constitutes the dorsal part of the genitalic "ring", while the extent of the vinculum is, in most cases, obvious. The caudal edges of the tegumen are folded in toward the mid-line beneath the anus, and are often more or less chitinized there, forming a subscaphium (*ssc*) which supports the anus.

This infolding continues cephalad and centrad as a membrane which envelops the oedeagus (*oed*), and is continuous with a similar fold that extends from the region of the bases of the harpés. In this latter fold there is considerable chitinization for the support of the oedeagus. For simplicity the term "juxta" (*jux*) has been used for the single, ventral, median portion of this oedeagus support, which lies between the sacculi of the harpés and fastens them together; and the term "anellus" (*an*) has been used for the expanded, paired, upper parts. These latter consist of two paired folds; the inner ones, which are the larger, form more or less of a trough for the support of the oedeagus; the outer ones consist of two arms which articulate with the upper, basal angles of the two harpés. Possible the latter may represent homologues of the transtilla in other Lepidoptera.

The oedeagus is more or less open dorsally, being thus for its terminal portion in the form of a trough; the ejaculatory duct (*ej. d.*) opens from it on the dorsal side, usually at about two-thirds from the base, and is provided with a single, triangular cornutus.

In the majority of the Nearctic species the saccus is very small; in many of the Palaearctic species it is of considerable length.

The harpé shows a great deal of modification, both in shape and in the development of chitinized ridges and teeth which are especially prominent in some of the Palaearctic species (*hippothoë, sarthus, virgaureae,* etc.). Occasionally it is greatly reduced in size, as in *li.* On the whole the developments of the harpé appear to be largely specific, and so cannot be used as safely in determining the relationships of the species groups as other less mutable characters.

TAXONOMY.

It would be fallacious to expect a study such as the present one, based largely on a single set of organs, to furnish all the data necessary for the working of a complete phylogeny. The male genitalia appear to be almost invariably distinctive for each species, and to furnish excellent characters for species differentiation; but in many species they fail to give any reliable clue to relationship with other members of the genus. In such cases the author has chosen to follow the path of discretion and refrain from arbitrary action based on guesswork, merely presenting the data for future consideration when material may be available for comparative studies of female genitalia and early stages.

In other cases, however, there occur such definite similarities of structure as to clearly indicate almost undoubted relationships. Systematic changes based on such cases have been made, even though they represent a considerable departure from the hitherto accepted classification. Previous ideas of the relationships of the Coppers have been based almost entirely on wing shape, color and pattern, characters which are notoriously changeable and therefore likely to be unreliable for phylogenetic purposes. While such characters have been by no means ignored in the present work, they have not been considered as important as definite similarities or differences in the genitalia. Thus, because of a very close resemblance of all its genitalic structures to those of a number of Palaearctic species, *cupreus* Edw. has been placed in the typically Palaearctic subgenus; and similarly *sarthus* Stgr., *caspius* Led. and *athamanthis* Ev. have been placed in the typically Nearctic subgenus.

Just what categories to use in formulating an intrageneric classification of *Lycaena* has been considerable of a problem. Certainly, because of insufficient dissimilarities and the presence of many annectant forms, not more than one genus would seem justified. Largely because of the presence in the Palaearctic of a number of single, isolated species, the exact relationships of which are at present indeterminable, the use of a number of subgenera alone was ruled out. Such a procedure would result in a disproportionate ratio of subgenera to species, and would necessitate the proposal of a considerable number of new names of doubtful worth.

It was finally decided to make use of but two subgenera, *L.* (*Lycaena*) for the series of typically Palaearctic species, and *L.* (*Tharsalea*) for the typically Nearctic series. In *L.* (*Lycaena*) must be included only one species of Nearctic distribution, *cupreus* Edw., and the sole Neotropical Copper, *pyrrhias* Godm. & Salv., besides the North American race *hypophlaeas* of the Palaearctic *phlaeas* L. Conversely only three species of Palaearctic occurrence are included in *L.* (*Tharsalea*).

In each subgenus the species have been divided into "species groups." In the Palaearctic series this seems a bit awkward because of the presence of a number of isolated species, each of which, showing no definite resemblance to any other, must be placed in a species group by itself. But in view of the close similarity of structure between members of some of the larger species groups, nothing else could well be done; and the result is probably far more natural than would be the case if any of these isolated species had been "lumped" together.

The linear arrangement of the species groups is largely one of convenience only, and is not to be construed as representing throughout any theories of relationship and phylogeny. In some cases, such as the placing of *kasyapa* between the *thersamon* and *dispar* groups, the arrangement expresses a relationship, as is brought out in the discussion of the groups. But in much of the remainder of the Palaearctic series, and in the larger part of the Nearctic, interrelationships are so inconclusively shown by the genitalia that it seems the part of wisdom to do nothing definite in this respect.

CHECK-LIST OF SPECIES STUDIED.

- Genus *Lycaena* Fabricius, type *Papilio phlaeas* L.
  - Subgenus *Lycaena*
    - *thersamon* group
      - *thersamon* Esp.
      - *phoebus* Blach.
      - *solskyii* Ersch.
      - *thetis* Klug
    - *kasyapa* group
      - *kasyapa* Moore
    - *dispar* group
      - (*dispar* L.)
        - (a) *rutilus* Wernb.
      - *splendens* Stgr.
      - *orus* Cram.
      - *pavana* Koll.
      - *standfussi* Gr.-Grsch.
    - *phoenicurus* group
      - *phoenicurus* Led.
    - *pyrrhias* group (*Iophanes* Draudt)
      - *pyrrhias* Godm. & Salv.
    - *alciphron* group
      - *alciphron* Rott.
      - *cupreus* Edw.
        - (a) *snowi* Edw.

- *virgaureae* group (*Heodes* Dalman)
  - *virgaureae* L.
  - *dorilis* Hufn.
- *phlaeas* group (*Lycaena* Fabr. *sens. strict.*)
  - *phlaeas* L.
    - (a) *abbotti* Holland
    - (b) *Feildeni* McLach.
    - (c) *hypophlaeas* Bdv.
- *amphidamas* group
  - *amphidamas* Esp.
- *li* group
  - *li* Oberth.
  - *pang* Oberth.
- *boldenarum* group
  - *boldenarum* White
- *salustius* group
  - *salustius* Fabr.
  - *enysii* Butler
- *hippothoë* group
  - *hippothoë* L.
- Subgenus *Tharsalea* Scudder, type *Polyommatus arota* Bdv.
  - *sarthus* group
    - *sarthus* Stdgr.
    - *caspius* Led.
  - *athamanthis* group
    - (*athamanthis* Ev.)
      - (a) *alexandra* Püng.
  - *arota* group (*Tharsalea* Scud. *sens. strict.*)
    - *arota* Bdv.
      - (a) *virginiensis* Edw.
  - *hermes* group
    - *hermes* Edw.
  - *xanthoides* group (*Gaeides* Scud. & *Chalceria* Scud.)
    - *xanthoides* Bdv.
      - (a) *dione* Scud.
    - *editha* Mead
    - *rubidus* Behr
      - (a) *sirius* Edw.
  - *gorgon* group
    - *gorgon* Bdv.
    - *heteronea* Bdv.
      - (a) *gravenotata* Klots

thoë group
  thoë Guér.
epixanthe group (*Epidemia* Scud.)
  epixanthe Bdv. & Lec.
    (a) *amicetus* Scud.
      anthelle Dbldy *non pub.*
      phaedrus Hall
  dorcas Kirby
      amicetus Dbldy. *non pub.*
      anthelle Scud.
      florus Edw.
    (a) *helloides* Bdv.
  nivalis Bdv.
  mariposa Reak.

DISCUSSIONS OF GROUPS

thersamon group (fig. 1)

The most outstanding characteristics of this group are: the very long, pointed lobes of the anellus; the moderately long, heavy juxta; the short saccus; the harpé, broad at base, tapering to a moderately slender tip which is armed in some species with small, infolded teeth or rugosities.

In these characters the species agree well with one another, and form a compact group of evidently closely related forms. They are also well connected together in color and pattern. Structurally they are differentiated best by the shape of the harpé, which furnishes excellent characters.

kasyapa group

In *kasyapa* the lobes of the anellus are considerably shorter and broader, and the saccus is longer than in the *thersamon* group; in these characters it approaches the *dispar* group. The juxta is, however, very short, more so than in any of the *thersamon* species. This would preclude placing it in the *dispar* group with which, however, it evidently forms an annectant.

dispar group (fig. 2)

The most outstanding characteristics of this group are: the long, slender juxta; the moderately long saccus; the reduction in width of the tegumen, labides and falces. The harpé usually broadens somewhat at the tip, and is there armed with short, infolded teeth.

In these characters *dispar, splendens, pavana* and *orus* agree well with each other, and are evidently closely interrelated. They differ from each other mainly in the shape of the harpé, which is longest and narrowest in *dispar,* and shortest and broadest in *orus*; in the shape of the oedeagus, which is very similar in *dispar, pavana* and *splendens,* but is comparatively little curved in *orus*; and in the length of the saccus, which is longest in *dispar* and shortest in *orus.* Distally the harpé of both *orus* and *standfussi* is somewhat more produced dorsally than ventrally, much as is shown in *pyrrhias* (fig. 3) and a number of other species. The juxta of *standfussi* is comparatively shorter than in the other three species. It seems as if *orus* represents a transitional form between *dispar* and *splendens* on the one hand and *standfussi* on the other, and then as if *standfussi* still further connects the group to the *thersamon group.* In this connection the fundamentally similar underside patterns of *orus* and *standfussi* are noteworthy.

phoenicurus group (fig. 4)

In its very short saccus and reduced anellus lobes, *phoenicurus* differs strongly from the *dispar* group; its juxta is also rather peculiar, being long but fused for a considerable distance with the sacculi of the harpés. In general its structures appear to show somewhat of a relationship to the *dispar* group, sufficient to warrant postulation of at least a slight degree of relationship.

pyrrhias group (fig. 3)

In *pyrrhias* the juxta is very short, which would seem to preclude a close relationship to the *dispar* and *thersamon* groups. The very long lobes of the anellus would seem, however, to place it somewhere in this vicinity, just as the slender, upcurved oedeagus also shows that it cannot be very closely related to any of the characteristic Nearctic species. In view of its peculiarities of structure, as well as of its peculiar position as the only Neotropical *Lycaena, pyrrhias* well deserves a position in a species group by itself. Its relationship is undoubtedly with the Palaearctic rather than with the Nearctic series, and is possibly rather ancient.

alciphron group (fig. 7)

The two members of this group, *alciphron* and *cupreus,* are very alike in genitalia; they differ essentially only in the length of the juxta, which is slightly longer and more curved in *alciphron,* and in the shape of the distal part of the harpé. Both agree with the *virgaureae* group in the possession of a spine near the dorsal margin of the harpé; but from this group they differ strongly in the shape of the harpé, in the toothing of the distal part of the harpé, and in their longer saccus. Because of fundamental similarities in these three features they would seem to be more closely related to the *dispar* group, in spite of the dorsal spine on the harpé and the much smaller lobes of the anellus. As might be expected, *alciphron* is slightly more like the *dispar* group than is *cupreus*.

The two North American forms, *cupreus* and *snowi*, are so much alike in genitalic structure that I hesitate to recognize them as separate species. The harpé of *snowi* appears to average slightly shorter and broader than that of *cupreus*; the dorsal, subterminal tooth on the harpé of *cupreus* averages larger than that of *snowi*. Careful study of the early stages, of the distribution, and of large series of the two forms must be made. For the present I am treating *snowi* as a race of *cupreus*, which is all that the genitalic structures warrant.

virgaureae group (fig. 6)

In the two species placed here, *virgaureae* and *dorilis*, the genitalia are so very similar that there can be no doubt that a very close relationship exists between the two. The harpé is wide, strongly "spoon-shaped," and bears a strong, triangular, infolded flap near the tip and slightly above the ventral margin; a strong, heavily chitinized spine points inward from its dorsal margin. In both the saccus is very short, and the falces are considerably reduced in size, while the labides are not.

Virgaureae and *dorilis* differ structurally from each other mainly in the shape and size of the anellus lobes; in *dorilis* these are slightly longer and more pointed than in *virgaureae*.

The shape of the harpé, as well as other structures, is so distinctly different from the condition found in the *alciphron* group, that I believe that the dorsal spine, which occurs in both groups, cannot be taken as an evidence of relationship; it may well have been developed independently.

phlaeas group (fig. 5)

Phlaeas shows no very distinctive structural characters, and may be regarded as comparatively unspecialized. The harpé is rather wider and somewhat less heavily chitinized than in the majority of other Coppers, and bears an infolded, chitinized ridge near the tip; it is thus similar to that of *virgaureae*, but shows no trace of the dorsal spine characteristic of that species. Possibly there is a relationship.

In studying a considerable series of specimens no constant difference was found between the genitalia of *p. phlaeas, p. hypophlaeas,* and *p. abbotti.* Even color and pattern differences between the two are relatively slight; so that the placing of *hypophlaeas* as a race seems thoroughly justified. *Feildeni* is, of course, another race, from the far Arctic regions; Holland's placing of it as a separate species is an example of extreme "splitting."

amphidamas group (fig. 8)

Like *phlaeas, amphidamas* shows no outstandingly distinctive characteristics such as would aid in determining its relationships to other species of *Lycaena.* The small, sharply triangular lobes of the anellus are rather different from those of any other species; likewise peculiar is the development of a small but heavily chitinized subscaphium. Except for this latter structure it is not unlike the two species studied of the *li* group, being rather closer to *pang* than to *li.*

li group (fig. 9)

The two species here included, *li* and *pang,* show in addition to the very distinctive pattern of the under side of the secondaries, a characteristic reduction in the size of the harpé that sets them apart from the other species of *Lycaena.* The latter character is more noticeable in *li* than in *pang.* In *pang* the tegumen is proportionately much broader than in *li,* which may point out a connection to the following three species groups. The distal portion of the oedeagus of *pang* is considerably reduced in size.

Probably *tseng* Oberth. and *ouang* Oberth. also belong in this group.

boldenarum group (fig. 10)

The most characteristic feature of the genitalia of *boldenarum* is in the structure of the lobes of the anellus, which are long, broad, and rounded at their ends; the tegumen is very broad, and the distal portion of the oedeagus considerably reduced in size. In one specimen examined there appear to be three cornuti. On the basis of the genitalia, no definite relationship of *boldenarum* to other Coppers can be traced with any security. Its small size, peculiar coloring and pattern, and geographic distribution also set it apart.

salustius group

Genitalically the species of this group show no distinctive characteristic such as would aid in determining their relationships. In general they resemble the other comparatively unspecialized species such as *phlaeas* and *amphidamas.* They are distinct from each other, differing in the shape of the harpé and the size and shape of the lobes of the anellus. Unquestionably they show no particular relationship to *boldenarum.* Possibly a careful study of their early stages will furnish a clue to their relationship.

hippothoë group (fig. 11)

Outstanding characteristics of *hippothoë* are: the very heavy oedeagus, the base of which is very strongly bent dorsad; the great specialization of the harpé, which has developed two distal processes each bearing a long, strong spine; the very peculiar shape of the juxta and anellus; the long saccus. Excepting the saccus, nothing resembling these occurs in any other species of *Lycaena* studied, save that there is a certain similarity in the harpé of the *sarthus* group. These distinctive specializations of the genitalia render futile any guesswork at the relationships of *hippothoë* based on these organs.

sarthus group (fig. 12)

With this group begins the subgenus composed of species, mostly Nearctic, in which the oedeagus is strongly bent ventrad. In all of these the saccus is short and weak, and the juxta and anellus, especially the former, somewhat reduced. Without doubt *sarthus* and *caspius* belong here, rather than with the other Palaearctic species in *L.* (*Lycaena*), as far as genitalic characters are concerned.

Sarthus and *caspius* are structurally very much alike, differing mainly only in the shape of the harpé which in *caspius* is a little more slender. The writer has only a few specimens for comparison, but is under a very strong impression that the two forms may be really members of a single species.

athamanthis group (fig. 26)

Athamanthis undoubtedly has close Nearctic relationships, as is evidenced by the structure of nearly all the parts of the male genitalia, but especially by the heavy, downcurved oedeagus and the shape and armature of the harpé. The position of the falces suggests a possible relationship to the *arota* group. The anellus lobes are rather like those of the *xanthoides* group, but are also similar to those of a number of Palaearctic species. The saccus is a trifle longer than that of any Nearctic species. These characters are rather indeterminate as regards exact relationships, so that beyond placing it here in the typically Nearctic subgenus nothing more can definitely be done for the present.

arota group (figs. 13, 14)

The chief characters which separate *arota* and *virginiensis* from the other species of *Lycaena* are the long, slender, unarmed harpé and the position of the falces, which are so strongly curved toward the meson that they practically lie in a transverse plane. In spite of their common possession of a tail at the anal angle of the secondary (a most untrustworthy character in *Lycaena*), *arota* and *virginiensis* show no close relationship at all to *hermes*, and Scudder's inclusion of all three in the genus *Tharsalea* would seem to have been unwarranted. There would be more justification for the separation of *arota* and *virginiensis* from all of the other Nearctic species of *Lycaena*, including *hermes*, using *Tharsalea* as a subgenus for them alone.

I have been unable to find any constant genitalic difference between *arota* and *virginiensis* (the specimens figured are extremes, but are connected by every degree of intergradation in other specimens), and I therefore strongly suspect that they are really members of a single species. *Virginiensis* may represent a color form which has become dominant east of the Sierras, forming a "race" there, though constituting only a color form in California. Such an explanation is perfectly in accord with genetical theory.

hermes group (fig. 15)

Structurally *hermes* is distinguished by the rather considerable development of the subscaphium (a character which likewise occurs in the *gorgon group*) and by the extreme reduction of the juxta. The lobes of the anellus, though lightly chitinized, and rounded, are of good size for a Nearctic species. The harpé is very similar in shape and armature to that of the following two species groups. Evidently *hermes* is, structurally at least, far closer to *gorgon* and *heteronea* than to its tailed Nearctic congeners.

xanthoides group (figs. 16–19)

The species here included are characterized by the structure of the anellus lobes, which are larger than in any others of the typically Nearctic series, and are pointed caudally; and by a somewhat less wide tegumen than is shown by most of the other Nearctic species. The juxta shows the double-curved condition also characteristic of the other related groups, but is considerably heavier than in any other Nearctic group. The falces are bent at nearly a right angle, a condition also found in the *gorgon* and *epixanthe* groups, and very different from the more gentle and gradual curve characteristic of the majority of the Palaearctic species.

The species are best separated from one another by the shape and armature of the harpé; in this respect *editha* appears to be closer to *xanthoides* than to *rubidus.*

No constant genitalic difference has been noticed between *r. rubidus* and *r. sirius,* forms which are unquestionable races of a single species.

Genitalically *xanthoides* and *dione* differ only in the teeth on the inner surface of the harpé, which appear to average slightly smaller in *xanthoides* than in *dione*; and in the juxta, which averages slightly thicker in *dione* than in *xanthoides.* These differences are extremely slight, and I suspect that study of a large series would show them to be of no value. Accordingly *dione* has been placed as a race of *xanthoides.*

gorgon group (figs. 20, 21)

The two species of this group are characterized by the small, rounded lobes of the anellus, the narrow, tapering harpé, and the rather wide tegumen. The caudal margins of the latter are folded toward the mid-line to form a rather strongly chitinized subscaphium for the support of the anus. Structurally the two species are distinguishable from each other by the shape and armature of the harpé, and by the rather narrower tegumen of *heteronea.* They are probably more closely related to the species of the *epixanthe* group than to any others.

thoë group (fig. 27)

The relationship of *thoë* to the other typically Nearctic species is evidently close, but its exact position is a matter of some doubt. The shape of the harpé is similar to that of *rubidus,* but the lobes of the anellus are rounded and not pointed as in the latter species. The falces are rather more gently curved than in the majority of Nearctic species. For the present it seems best to place it in a species group by itself.

epixanthe group (figs. 22–26)

The four species placed here are evidently closely interrelated. They are easily distinguishable from each other by the shape of the harpé, but great care must be exercised in using this character, for a very slight degree of distortion, or difference in the angle at which this structure is viewed, may cause it to appear of a very different shape.

There has been considerable confusion in the literature with regard to *dorcas* and *epixanthe,* a part of which can be cleared up here. Boisduval apparently applied MSS. names to northern examples of both these species, but these were never published by him. These were *amicetus* for an *epixanthe* form (presumably) and *anthelle* for a *dorcas* form; the *chirotype* of the latter is in the U. S. National Museum, ex. Boisduval, Oberthür and Barnes collections, and is, according to Mr. Benjamin, a *dorcas*. Both of these Boisduval MSS. names were listed by Doubleday (List Lep. Brit. Mus., *2*: 55), but as *nomina nuda,* unaccompanied by any description or diagnosis; they were therefore not officially published by Doubleday, and his mere listing of them was insufficient to validate them. Perhaps this is as well, for he very evidently had reversed Boisduval's application of them. This is shown by the fact that three of the four specimens which he mentioned under the designation of "Polyommatus anthelle Boisduval MS." are still in the British Museum, and are certainly *epixanthe* according to Mr. N. D. Riley, who very kindly examined them for me. Presumably Doubleday's other series, which he designated as "amicetus" were *dorcas*; these specimens have been lost.

The first validation of these names, as pointed out by Barnes and Benjamin, was by Scudder (1876, Bull. Buffalo Soc. Nat. Hist. *3*: 128). Here Scudder agreed with Boisduval, since *anthelle* is placed as a synonym of *dorcas,* and *amicetus* as a synonym of *epixanthe.* It is very doubtful if the former is worth retaining as a race, but the latter certainly is. In that case *phaedrus* Hall, described from Nova Scotia and Newfoundland, must be placed as a synonym of *amicetus.* The type locality of *phaedrus* is, of course, that of the holotype—Nova Scotia—but *phaedrus* does not differ appreciably from Newfoundland examples. On what material Scudder based his allocation of these names will probably always remain in doubt. The writer searched the collection of the Museum of Comparative Zoology, where Scudder's collection reposes, but was unable to find any material more pertinent than one Labrador specimen of *dorcas* from the Scudder collection.

Between *dorcas* and *helloides* no constant genitalic difference could be found, although a considerable series of each was studied. They are accordingly placed as members of a single species. They cannot, however, be regarded as strictly geographic subspecies, for there is a large overlap of their ranges. However, as shown by McDunnough (Can. Ent. 1922, *44*: 136), the ecological ranges occupied by the two forms are quite constantly different, and it is probable that they have different food-plants. In this respect the writer's own observations in Colorado and Wyoming agree well with those cited by McDunnough for Alberta.

To the majority of workers such a difference in habitat and probable difference in food-plant, combined with a large overlap in geographic distribution, may seem to constitute a reason for considering the two forms as separate species without further ado. With this viewpoint the present writer cannot agree. He can see no reason for holding to the idea that two strains can diverge only under the influence of differing geographic environments, and when separated by a geographic barrier.

Probably in addition to *geographic subspecies* there can be formed *host subspecies,* as influenced by a combination of space-isolation, environmental and food factors, *food-plant subspecies, habitat subspecies,* and various others, as well as combinations of more than one type. In the divergence of two strains there must be at least two primary factors, viz., the origin of inheritable differences to cause the divergence, and the presence of some sort of a barrier to prevent subsequent mixing of the strains, and consequent relegation of them to the status of mere variant (Mendelian) forms. The new inheritable character may affect any part or parts of the anatomy, ecology or genetics of the organism; dependent on this expression, and its "survival value," is our classification of the diverging strain as one or another kind of "subspecies."

Considering the problem of species differentiation in this light, it is seen that *dorcas* and *helloides* may well be considered as members of a single species; separated from each other by some barrier (genetical?) of which at present we know nothing, they have diverged along ecological rather than along structural lines.

The essential question, of course, is one of where to draw the line between "species" and "subspecies"; for both are essentially the same, differing only in degree. This question must at present be answered for himself by every worker in every different group of organisms, and will probably be answered differently by most workers in the same group. Obviously one of the best criteria that can be applied within so small a category as a genus, a group of closely related organisms, is the degree of structural differentiation between what are admittedly closely related, but obviously distinct, species in that genus.

Applying this criterion in the present case we see that in the great majority of instances, forms which evidently are closely related yet distinct species, are invariably easily and constantly separable by genitalic characters. Examples of this in *Lycaena* are the differences between the four species of the *epixanthe* group, between *gorgon* and *heteronea,* between *xanthoides, editha* and *rubidus,* between the species of the *thersamon* group, etc. These would all seem to point to the necessity of our considering that the presence of some degree of structural differentiation is a necessary criterion of the separation of "species" in this genus. The writer therefore feels that his "lumping" of *arota* and *virginiensis,* of *xanthoides* and *dione,* of *cupreus* and *snowi,* and of *dorcas* and *helloides* is justified.

SUMMARY

Study of the male genitalia of *Lycaena* furnishes data as to the interrelationships of many, but not all, of the species, and points to the following general conclusions:

(1) All of the species should be included in a single genus.

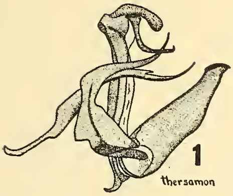
(2) The greater number of the Palaearctic species are more closely related to each other than to the majority of the Nearctic species, and *vice versa*; this is shown by similarities of structure and by the presence of annectant forms. For the Palaearctic series the nymotypical subgenus *L.* (*Lycaena*) is used; for the Nearctic series the subgenus *L.* (*Tharsalea*) Scudder. No further subgeneric divisions seem warranted at present.

(3) In the majority of cases, species that are distinctly separable from each other by well-marked color and pattern differences also show distinct and constant genitalic differences. It is therefore considered that the presence of genitalic differences may be established as a criterion of species separation in this genus.

EXPLANATION OF FIGURES.

All figures are based on tracings made with a camera lucida. No constant scale of enlargement was followed. The following abbreviations have been used:

an = anellus
ej.d. = ejaculatory duct
fal = falx
jux = juxta
lab = labis
oed = oedeagus
sac = saccus
scls = sacculus
ssc = subscaphium
teg = tegumen
vinc = vinculum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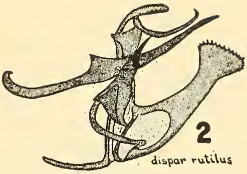
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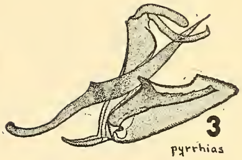
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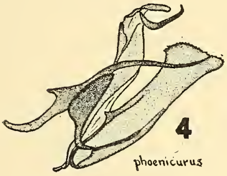
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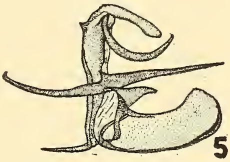
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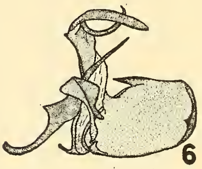
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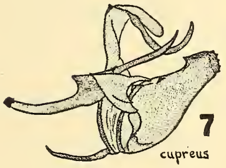
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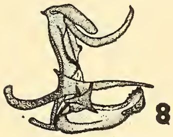
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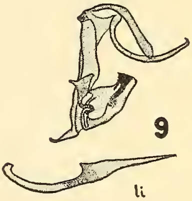
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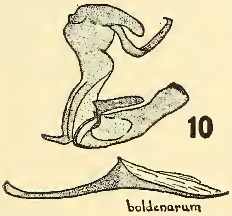
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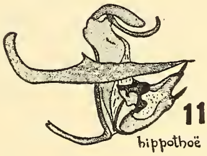
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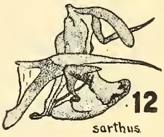
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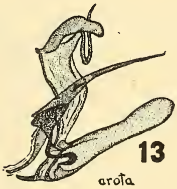
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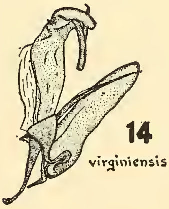
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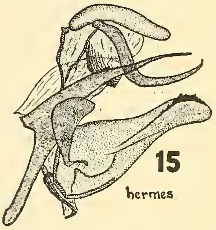
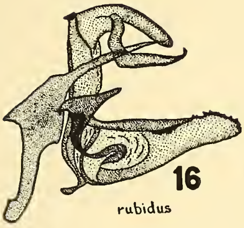

15 hermes

Plate VIII.

Fig. 1—*Lycaena* (*Lycaena*) *thersamon* Esp.
" 2— " " *dispar rutilus* Wernb.
" 3— " " *pyrrhias* Godm. & Salv.
" 4— " " *phoenicurus* Led.
" 5— " " *phlaeas* L.
" 6— " " *virgaureae* L.
" 7— " " *cupreus cupreus* Edw.
" 8— " " *amphidamas* Esp.
" 9— " " *li* Oberth.
" 10— " " *boldenarum* White
" 11— " " *thoë* L.
" 12— " (*Tharsalea*) *sarthus* Stgr.
" 13— " " *arota* Bdv.
" 14— " " *a. virginiensis* Edw.
" 15— " " *hermes* Edw.

Plate IX.

Fig. 16—*Lycaena* (*Tharsalea*) *r. rubidus* Behr.
" 17— " " *x. xanthoides* Bdv.
" 18— " " *x. dione* Scud.
" 19— " " *editha* Mead.
" 20— " " *gorgon* Bdv.
" 21— " " *h. heteronea* Bdv.
" 22— " " *e. epixanthe* Bdv. & Lec.
" 23— " " *nivalis* Bdv.
" 24— " " *mariposa* Reak.
" 25— " " *h. helloides* Bdv.
" 26— " " *athamanthis alexandra* Püng.
" 27— " " *thoë* Guer.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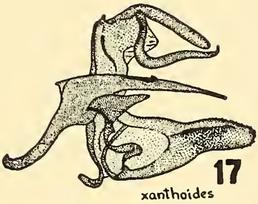
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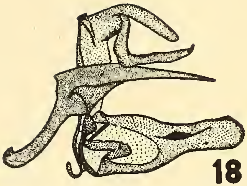
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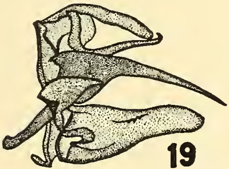
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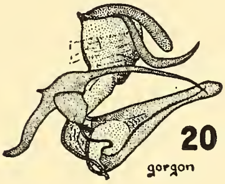
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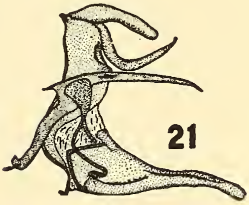
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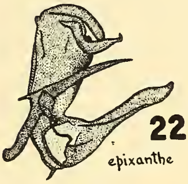
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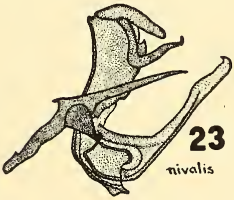
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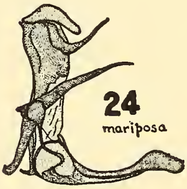
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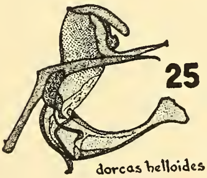
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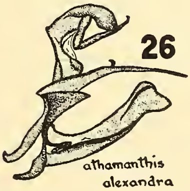
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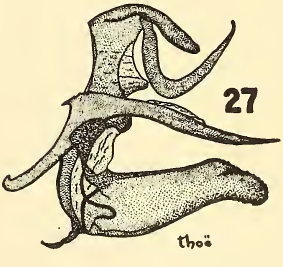
27
thoë

NEW OMMATIUS WITH A KEY TO THE SPECIES (DIPTERA, ASILIDAE)

By J. Wilcox, Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture,
Puyallup, Washington.[1]

In this paper on the genus *Ommatius* Wiedemann, two species are described as new, a key to the species known to occur in the United States is given, and figures of the male genitalia of those species represented by male specimens are included to facilitate the determination of the species. A single specimen each of two other species which may be new is at hand, but they are not described as further collecting may show them to be variations of *O. tibialis* Say. One, from Texas (San Antonio, VI–13 '33, G. P. Engelhardt), has the femora wholly yellowish but with male genitalia similar to those of *tibialis,* and the other, from Florida (Ft. Lauderdale, VI–23 '33, Marston Bates), has the apices of the femora black and the male forceps apically more acute and slender than in *tibialis;* Williston[2] mentions a similar specimen from Georgia. References to the descriptions of the species described since the Aldrich Catalogue are given in the key; Williston[2] gives a description of *tibialis.*

The genus *Ommatius* Wiedemann belongs in the subfamily Asilinae and differs from the other genera in having the style of the antennae long and pectinate below;[3] the metanotal slopes are bare. Curran[4] has given a key to the American species and described several new species, none of which, however, were from the United States.

Key to the Species of Ommatius

1. Marginal scutellar bristles present 2
   Marginal scutellar bristles absent 5
2. Legs wholly black except the tibiae narrowly reddish at the base; bristles of the body and legs largely white; abdomen wholly black in ground color; length 7–8 mm. (Ariz.) **beameri,** n. sp.

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[1] The writer is indebted to Dr. R. H. Beamer, University of Kansas, and to Mr. E. P. Van Duzee, California Academy of Sciences, for the loan of specimens, and to Dr. Marston Bates, Mr. G. P. Engelhardt, and Mr. D. K. Duncan, for supplying specimens.

[2] Trans. Amer. Ent. Soc. XII: 76, 1885.

[3] Curran, North American Diptera: 166, fig. 27, 1934.

[4] Amer. Mus. Novitates No. 327: 1–6, 1928.

At least the fore and middle femora largely, and the tibiae largely, yellowish; bristles largely black; abdomen largely yellowish or brownish in ground color; larger species . . 3

3. Mesonotum anteriorly with numerous erect hairs about as long as the first antennal joint and posteriorly with numerous longer hairs; basal petiole of the fourth posterior cell twice as long as the anterior cross vein; length 18–19 mm. (Ariz.) . . . . **baboquivari**, n. sp.

Mesonotum anteriorly with very sparse, short hairs and posteriorly without longer hairs except in the dorsocentral rows and below the supra-alars; petiole at base of the fourth posterior cell at most subequal in length to the anterior cross vein; smaller species 4

4. Third vein branching at or before the discal cross vein; femora of both sexes, if blackish, blackish on the apical fourth only; length 9–11 mm. (N. C., Miss., Ark., Okla.) (Jour. Elisha Mitchell Scien. Soc. XLIII: 205, 1928). *gemma* Brimley

Third vein branching well beyond the discal cross vein; basal two-thirds of the male hind femora black and the middle half of the female hind femora brownish; length 11–13 mm. (Ariz.) (Canad. Ent. XLIII: 129, 1911). *pretiosus* Banks

5. Mesonotum with the broad central stripe and a broad stripe on either side, bisected by the transverse suture, shining black; male femora largely black, female femora yellowish, the apical fourth black; wings glassy hyaline; length 9–11 mm. (Ariz.) (Canad. Ent. XLIII: 128–129, 1911) *maculatus* Banks

Mesonotum wholly pollinose 6

6. Fore femora entirely and the middle femora, except at the tip, yellowish; segments 1 and 8 of the abdomen reddish; length 11–12.5 mm. (Ariz.) (Amer. Mus. Novitates No. 813: 9, 1935) . . . . ♀♀ *bromleyi* Pritchard

At least the anterior side of the fore and middle femora black; abdomen wholly black in ground color 7

7. Femora entirely black except the hind femora narrowly reddish at the base; male costa not at all thickened or clouded; length 9–11 mm. (Ariz.) (Jour. N. Y. Ent. Soc. XXIV: 69, 1916) . . . . *parvulus* Schaeffer

Posterior side of the fore and middle femora yellowish; male costa broadly thickened and the adjacent cells clouded brown; length 12–16 mm. (Eastern States and West to Kans., Okla., and Tex.) . . . . *tibialis* Say

Ommatius beameri, n. sp.

Male: Length 7 mm. Face densely white pollinose, front and vertex thinly brownish pollinose, the occiput densely gray pollinose, the palpi, proboscis, and ocellar tubercle shining black. Hairs and bristles white, the mystax dense, the ocellar tubercle with about 8 weak erect bristles. Antennae black, the joints subequal in length, the first joint white haired and the second largely black haired, the style about 5 times as long as the third joint and with about 16 long black hairs below.

Mesonotum black, gray pollinose, the central and lateral stripes brownish; hairs long white, as long as the 3 antennal joints together, the lateral stripes bare of hairs; bristles white, 2 presutural, 1 supraalar, 1 postalar, and 3 strong posterior dorsocentral. Scutellum gray pollinose and long white haired with 4 white marginal bristles. Pleura and coxae densely gray pollinose and white pilose.

Abdomen black, gray pollinose and fine white haired. Genitalia small, shining black, and densely white haired.

Legs black, the tibiae narrowly brownish at base; hairs white; bristles white, some of those on the tarsi black; claws black, broadly reddish basally; pulvilli yellowish. A double row of bristles below on the hind femora, the anterior bristles being finer and longer than the posterior ones.

Squamae brownish, the margin and fringe white. Halteres yellowish white, the base and lower stem brown. Wings hyaline, the veins brown, yellowish basally; the basal petiole of the fourth posterior cell slightly longer than the anterior cross vein; anterior cross vein at the middle of the discal cell; third vein branched beyond the discal cross vein.

Female: Length 8 mm. Similar. Hairs of the mystax not as dense as in the male and only 2 scutellar bristles present. Abdomen (segments 1–8) wholly pollinose.

Holotype: Male, Patagonia, Ariz., VIII–21 '35 (R. H. Beamer), in the Snow Collection, University of Kansas.

Allotype: Female, same data, in the Snow Collection, University of Kansas.

Paratypes: 2 females, same data, in the writer's collection.

Ommatius baboquivari, n. sp.

Male: Length 19 mm. Head densely yellowish white pollinose, the palpi brown and the proboscis black. Hairs white except 6 longer bristles in the mystax and 2 short, fine, erect bristles on the ocellar tubercle, black. First two joints of the antennae yellow, the third and the style brown; first two joints white haired, the style 6½ times as long as the third joint and with about 16 ventral hairs.

Mesonotum densely yellowish gray pollinose, the central stripe and lateral spots indistinctly brown. The numerous erect hairs black except those on the humeri and lateral margins yellowish, anteriorly the hairs about as long as the first antennal joint and posteriorly about as long as the 3 joints together. Bristles black, 2 presutural, 1 supra-alar, 2 postalar, and 3–4 fine posterior dorsocentral. Scutellum, metanotum, pleura, and coxae densely yellowish pollinose; scutellum with a pair of black marginal bristles and a few erect black hairs apically; pleura and coxae white haired. The coxae, pleura, and humeri are apparently yellowish in ground color.

Abdomen brownish in ground color and thinly yellowish gray pollinose; hairs yellowish, long on the sides of segments 1–3, short recumbent otherwise, the narrow dorsum of segments 1–8, and segments 7–8 posteriorly, black haired. Segment 1 with 2–3 black lateral bristles, and the remaining segments with a posterior row of weaker bristles, yellowish on segments 2–5, black on segments 6–8. Venter yellowish gray pollinose, segments 1–3 with numerous fine erect yellowish hairs; segments 4–7 with numerous erect stout brownish bristles, those on segments 4–5 pointed apically and those on segments 6–7 blunt apically; segment 8 with long, fine black and yellow hairs. Genitalia shining yellowish red, as long as segments 6–8 together, bare, the upper forceps basally with black hairs, the cerci short black pilose above and yellowish pilose below.

Legs entirely yellowish, the hind femora with a small brown spot posteriorly at about two-thirds its length. Femora largely black haired, the hairs ventrally and posteriorly on the fore femora, the middle femora except dorsally, and the hind femora except the basal half dorsally and ventrally, yellowish. Tibiae short black haired and with long yellowish hairs posteriorly on the fore tibiae, and ventrally on the middle and hind tibiae. Tarsi black haired; claws black, narrowly reddish at base; pulvilli yellow. Bristles black, the fore and middle femora without ventral bristles, the hind femora below with a double row of 3 bristles each, hind trochanters each with 2 weak black bristles.

Squamae and halteres yellow, the former with a yellowish fringe. Wings hyaline, grayish villous apically, the veins dark brown, the fourth posterior cell basally with a petiole about twice as long as the anterior cross vein, anterior cross vein at about seven-twelfths the length of the discal cell, the third vein branched well beyond the discal cross vein.

Female: Length 18 mm. Similar. Largely greased and in this condition the humeri, lateral margins of the mesonotum, postalar calli, scutellum, metanotum laterally, and the pleura and coxae except a black spot below on the mesosternum and metasternum, yellowish in ground color. Hairs on the second antennal joint black, 2 of the occipital bristles on either side black, the hairs of the mesonotum shorter than in the male, and the scutellum yellowish haired. Venter of abdomen with short, fine recumbent yellow hairs, segments 7–8 shining brownish and largely black haired. Femora and tibiae lacking the long yellowish hairs of the male.

Holotype: Male, Baboquivari Mts., Ariz., VII–19 '32 (R. H. Beamer), in the Snow Collection, University of Kansas.

Allotype: Female, Baboquivari Mts., Ariz., IX–1 to 15 '23 (O. C. Poling), in the California Academy of Sciences.

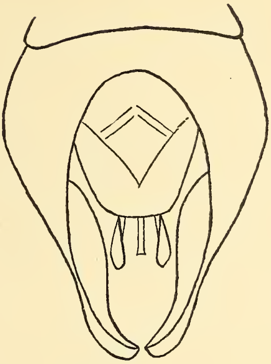
Paratypes: 1 male, same data as allotype, VIII–1 '24, in the California Academy of Sciences; and 1 female, El Oro Mine, Baboquivari Mts., Ariz., VIII–16 '32, 4,000 feet (D. K. Duncan), in the writer's collection.

This is apparently the largest species found in the United States, while *beameri* is apparently the smallest.

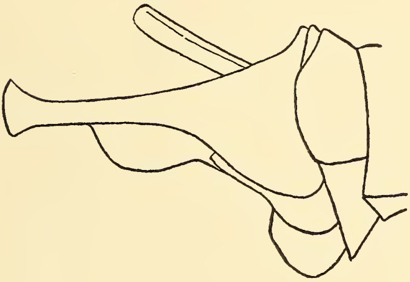
EXPLANATION OF PLATE X.

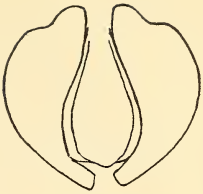
Male genitalia of *Ommatius* species; in each case the upper figure shows a dorsal view with the apex toward the bottom of the page, and the lower figure shows a lateral view with the apex toward the left-hand side of the page; all are drawn to the same scale.

Spruce on the Gaspe peninsula had been heavily attacked over an area of about 2,000 square miles in 1931 by the European spruce sawfly. In 1933 the area was 4,000 square miles, and now it is nearly 6,000.—N. Y. Sun.



BABOQUIVARI





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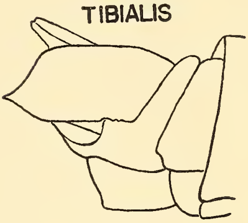
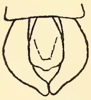
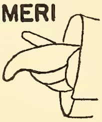
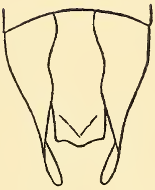




BEAMERI





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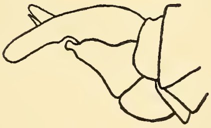
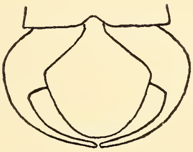
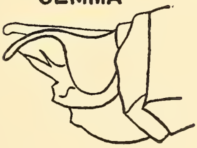
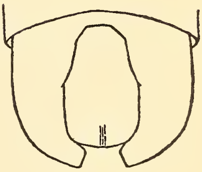




GEMMA





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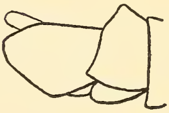

A NEW POTAMOBATES FROM PERU, S. A. (HEMIPTERA, GERRIDAE).

By H. B. Hungerford, Lawrence, Kansas*

This interesting genus of water striders extends from Mexico to Peru. Two species have been described from Mexico, one from Costa Rica, one from Panama, one from Colombia, South America, one from Ecuador and the following from Peru, South America, which represents the farthest southern record known to date:

Potamobates peruvianus n. sp.

Size: Length of winged male, 12 mm.; length of wingless male 10.5 mm.; length of winged female 12 mm.; length of wingless female 9.3 mm. The females somewhat plumper than the males.

Color: Body black above; venter pale. Head light brown above with a diamond shaped black spot, antennae dark brown to black, beak black-tipped. In the winged forms the anterior lobe of the pronotum is marked by a pale brown more or less diamond shaped spot and the posterior lobe has the humeri, a broad band on the rounded posterior margin and a thin line on lateral margins pale brown. Hemelytra dark with costal margins brown. In the wingless forms the anterior lobe of pronotum has a pale brown triangular spot on dorsum and a silvery patch on the side behind each eye; the mesonotum entirely black except for a silvery triangular patch above the meso-acetabula and, in a few specimens, two small brown spots on the dorsum; lateral margins with longitudinal silvery stripe and silvery patches on meso- and meta-acetabula; abdominal dorsum black except for some silvery pubescence laterally; all the coxae, and dorsal side of front trochanters and femora pale like the venter; front legs otherwise black, middle and hind legs brown, the femora longitudinally striped, above and below with black lines; lateral margins of abdomen and caudo-lateral margins of first genital segment of the male black.

Structural characteristics: Antennal formula of male holotype: 1st : 2nd : 3rd : 4th : : 9 : 3.3 : 3.4 : 4.4. Tip of beak barely attaining anterior margin of front coxae. Pronotum of wingless male a little longer than half the width and shorter than the length of the head. Posterior lobe of pronotum in winged

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* Contribution from the Department of Entomology, University of Kansas.

form with a longitudinal median carina, humeri elevated and connected transversely by a low ridge; rear margin broadly rounded. Mesonotum of wingless male a little more than three times the length of pronotum measured on dorsal line; a faint median depressed line on caudal third of mesonotum. Metanotum as long as the pronotum. Front legs short with anterior femora incrassate, somewhat more incrassate in the males than in the females. Front tarsus of male a little more than one-fourth the length of the tibia; the first tarsal segment one-third as long as the second. Intermediate and posterior legs long and slender. Formula for intermediate leg of male: femur: tibia: tarsus:: 16: 11: 6, first tarsal segment three times the second. Formula for posterior leg: femur: tibia: tarsus:: 16: 9.25: 1.25. Posterior tarsus small, first segment longer than the second. The last abdominal tergite of male about as long as the three preceding. In the male the connexivum is triangularly produced behind. In the female the connexivum is produced into a long, finger-like process, thicker in its distal half and somewhat incurved and slightly longer than the last two tergites. The first genital segment of the male measured on the median dorsal lines as long as four preceding abdominal tergites. The general shape of this segment like that in *P. tridentatus* Esaki and *P. williamsi* Hungerford but having a single large marginal tooth instead of two, this occupying the position of the distal one in those species. The hook-like tooth of the second genital is shaped much like that of *P. williamsi* Hungerford. The female genital segments much as in above species. The incision of the posterior margin of the sixth ventral segment of female decidedly asymetrical.

Location of types: Holotype, allotype, holomorphotype, allomorphotype, and various paratypes in the Francis Huntington Snow Entomological Museum, University of Kansas. Paratypes sent to U. S. N. M., British Museum, Doctor Carl Drake, and Professor T. Esaki. This species described from seven winged specimens, 3 males and 2 females labeled, "Peru S. A. Sept. 5, 1935 F. Woytkowski, vicinity Sani Beni, 840 meters above sea level, River Sani Beni." and a pair labeled "Peru, S. A. Nov. 4, 1935 F. Woytkowski vicinity Rio Negro, 790 meters above sea level on the river" and 58 wingless forms labeled Peru, S. A. Sept. 5, 1935 F. Woytkowski, vicinity Sani Beni, 840 meters above sea level, River Sani Beni," 12 wingless, labeled like thost of November 4th above, and 15 taken in May from the vicinity of San Pedro, 900 meters above sea level from jungle pools by the same collector. Holotype, allotype, holomorphotype, and allomorphotype from the collections of September 5th, 1935.

Comparative Notes: This species is much like *P. tridentatus* Esaki and *P. williamsi* Hungerford but lacks any median brown stripe on the mesonotum of the wingless forms. The first genital of the male has only one large marginal tooth instead of two. The female like the two species above has long finger-like projections of the connexiva but they are somewhat thickened distally.

EDITORIAL

PUBLICATION AND ITS DIFFICULTIES.

In another part of this number will be found the notices of two recent works—Balduf's "Bionomics of Entomophagous Coleoptera" and Weiss's "Pioneer Century of American Entomology." These are two important works, the fruits of vast labor and research, which the authors themselves have had to publish at their own cost and risk—no commercial publishers could be found to undertake either, because, forsooth, there was no money in them! But this attitude is too well-known to cause astonishment. Business is dedicated to the proposition of making money.

Still, it might seem that publishers might once in a while act as patrons of the sciences by taking an occasional risk of loss. Either of these two works could have been printed in a limited edition for not to exceed $1500 apiece; a sale of 500 copies at $3 would have covered. But the overhead, the advertising, the publisher's profit, the retailer's profit would add another $1500 to the cost of printing at least. Yet, either of these works could have been priced to retail at $6 and still have found the same sale. And further, the nature of the two works is such that there would be a steady continuing small sale.

And so, the author has to dig into his own pockets to publish his work, or suppress work of great interest and importance; not to mention the terrible waste of energy from all the research and labor required to round out and complete the data scattered through countless publications, spread over years—in Dr. Weiss's case, centuries.

Meantime, our entomological works and publications are making heavy weather. Those on whom they depend—professional or not—are sharing the common lack of wealth; and alas! cannot do what they would.

J. R. T.-B.

BOOK NOTES.

The Bionomics of Entomophagous Coleoptera, by Walter Valentine Balduf. Pp. one not numbered + 1–220, figs. 1–108. (John S. Swift & Co., Inc., Chicago, Ill., 1935. $4.50).

This is one of those invaluable source works devoted to a single Order of insects and bringing together so far as is humanly possible, all that has been published with regard to one single aspect of their biology. It is, of course, limited by the stated purpose; but no other aspect of habits is omitted, from embryological development through the entire life-cycle, so far as known. For life is a whole, not a thing of delimited and isolated cubby-holes, each apart from all the others. Life is a weave, no single thread of which can reveal the broad pattern, but every thread must be considered in relation to all the others, in order to approximate a final truth.

The treatment is by families, serially arranged according to the best and latest generally accepted catalogues. The figures are excellent and well reproduced, from drawings by Mrs. Balduf. There is an extensive bibliography arranged under families, which takes up some 17 pages. The Index takes up 35 pages; the insect names are arranged alphabetically according to genera; and under each species, also alphabetically, are the several topics dealt with for that species; author names are included in this index, also in alphabetical order.

Dr. Balduf is to be congratulated on this work; through it, he lays all coleopterists as well as students of insect bionomics under a deep debt of gratitude.

The Pioneer Century of American Entomology, by Harry B. Weiss. Pp. 1–320. (Published by the author, New Brunswick, N. J. $4.25).

Dr. Weiss, in this work, brings into the field of living men those who in this country labored in a fallow field and established the broad lines of American Entomology. In these pages, we meet the great and the small, the remembered and the forgotten—men remembered by their work, or immortalized (we hope) in entomology by a name attached to an insect.

Dr. Weiss begins his account with the early travellers from 1588 to 1723, although he mentions the scattered comments of the Spanish explorers and conquerors as early as 1526. Even in those days of struggle and trial, there were men who at least attempted to get some understanding of nature. From 1731 to 1800, we get the true naturalists, beginning with Mark Catesby and going through the three Bartrams, Lewis, Byrd, Kalm, Hughes, Ellis, Collinson, Thaddeus M. Harris, Barton, Burnaby, Peck, up to John Abbott, and including many lesser lights.

From 1800 on we begin to know the true entomologists; bare names here become persons with all their foibles and greatnesses. To name them would be to call the roll of the illustrious names known to every student of insects. Yet we also become acquainted with such personalities as Latrobe, the architect; Charles Coatesworth Pinckney, of Revolutionary fame; John Torrey, the botanist; Rafinesque; Timothy Dwight, president of Yale College; DeKay, Zimmermann, Lorquin; and so many others less conspicuous.

There is a short bibliography of sources; and a complete index of names.

The first paragraph of Dr. Weiss's "Postface" demands thoughtful attention. It reads: "It is a matter for regret that this book should not appear in printed form. Various commercial publishing houses, university presses, and several foundations were approached, but the manuscript was refused. The commercial firms stated that the market for a history of entomology was not extensive enough to warrant publication. The university presses wanted the book to be subsidized. The foundations had no funds."

What a commentary on our vaunted culture! Had he written on "The Scandals of Insect Polyandry," the commercial publishers would have stormed his gates. Had he produced a documented demonstration that human beings have two matching eyes, no university press but what would have yearned to father and mother the great discovery. And as to the foundations, this abstract from "Science" is not without interest: The Rockefeller Foundation spent in 1935 the prodigious sum of $12,725,439; of this appropriations in the natural sciences came to $2,426,125. Reading the list of the grants, two facts stand out: they were made to rich institutions which should be self-supporting; and they were in general for well-publicized research in biology, from genetics to hormones. No less than seven of these grants were to European institutions of learning! And not one cent (apparently) for entomological research *per se!* It might seem as though a small proportion of such funds might be allocated to pure entomology, say $10,000—which is eight one-hundredths of one per cent, or 1/1250, of the whole. And since some of the greatest work of this foundation—its yellow-fever research and control work—is based on entomology, it might seem as though so opulent an institution could easily make a ten-thousand dollar gesture.

Under the circumstances, Dr. Weiss's book is one of those modern reproductions by some photographic process from the typed original. It is good, but it lacks the dignity of the more formal printing from type.

Meantime, as the edition is limited to 150 copies, it might be well if our readers lost no time in getting theirs; for this is a book for pleasant reading; and also for permanent reference.

And finally, the Brooklyn Entomological Society is no Midas, but it is a Maecenas in its humble way. Our ENTOMOLOGICA AMERICANA is brought to the attention of authors of such important works. Arrangements can always be made.

General Entomology, by Robert A. Wardle. Pp. i–vii–1–311, figs. 1–96. (P. Blakiston's Son & Co., Inc., Philadelphia, Pa. 1936. $2.25).

This new book of Dr. Wardle's is difficult to appraise. It is completely worked out; it is modern in every aspect; it is provocative of thought. With these goes a very great condensation, so great that a whole vast subject is compressed into 301 pages of text! As a sharp reflection of the current state of the science, it is destined to be extremely useful. As a text, however, it will require much elucidation by the teacher; not that the work is not lucid—it is, extremely so—but that to condense so much matter into so restricted a space compels the ruthless pruning of all redundancies. The backgroundless student will be swamped—not because of obscurity or difficulty, but because each page is replete with facts, many of which demand antecedent knowledge on many subjects.

There are twelve chapters, the first five dealing with external anatomy, development and life-cycle, physiology, behavior. The next seven deal with the several taxonomic groups. Necessarily, to include this systematic matter in 175 pages makes it imperative to present only salient facts. For example, the great Order Heteroptera (Hemiptera herein), whose importance to man is day by day becoming more appreciated, is compulsorily discussed in only 5 pages! A key to the families fills one page; structure and morphology are presented in a little more; a few remarks on habits fill another page; figures take up about the same space; and general remarks on the Order fill the remainder. Only three of the economic forms are specifically named—*Blissus, Anasa* and *Murgantia;* but not one of the parasitic or blood-sucking species that convey disease producing organisms. This is mentioned merely to bring out the extreme abridgment demanded by space limitations.

The figures are excellent and well reproduced; the letterpress is beautiful; the paper very good; and the pleasing and sturdy binding is water- and vermin-proof.

But I can think of no better conceived and executed work of this general nature. In fact, a busy entomologist could profitably read this through to brush up his general knowledge and keep in touch with current ideas. J. R. T.-B.

EFFECTS OF THE PROTECTIVE VAPORS OF THE COREID BUG THASUS GIGAS ON A TARANTULA (EURYPELMA SP.).

By Richard T. de la Torre-Bueno and Wilfred G. Ambrose,
Tucson, Ariz.

On the evening of July 23, 1936, an adult *Thasus gigas* was given for food to a captive tarantula (*Eurypelma sp.*). After scrutinizing it warily for several minutes, the tarantula pounced on the bug. After perhaps thirty seconds, the *Thasus* waving its legs feebly, the tarantula started to give way, slowly rolling over on its side away from the *Thasus* and ineffectively pawing the air with the second and third legs on one side as if for support. The insect, released, dragged itself away. The tarantula lay flat on the floor of the cage, legs drawn up. In a minute or two it was again moving around, but it was quite sluggish and much the worse for its experience. When the *Thasus* was pushed toward the tarantula, the latter scuttled rapidly away.

The *Thasus* had received a cut about one quarter inch long on the venter and an injury to the right hind leg. When first released by the tarantula, it used this leg with difficulty for a while, but it gradually became paralyzed and was bent under the body. When the insect was removed from the jar about twenty minutes after the attack, the entire leg broke off. During this time the *Thasus* had twice rolled over on its back, seemingly dead, but when it was stirred up was quite as lively as before. Perhaps ten minutes later, because of humanitarian impulses, the untrained observers, not attaching any importance to their observations, killed the *Thasus*.

The next day the tarantula was observed to be very subdued, lying on the bottom of its jar with legs drawn up close. The left leg of the first pair, however, was held almost straight up and was somewhat paralyzed. The left leg of the fourth pair was completely paralyzed and stiff and was bent under the cephalothorax. The tarantula was sluggish, and when a hand was brought near, it did not take alarm as it ordinarily did. Presently it also was killed, again because of humanitarian impulses.

Thasus gigas is quite common on mesquite (*Prosopis velutina*), especially on the pods, on which it feeds, according to A. A. Nichol, assistant professor of botany at the University of Arizona.

The tarantula was kept in a desiccating jar about ten inches in diameter, covered with a perforated piece of paper.

PROCEEDINGS OF THE SOCIETY

Meeting of January 16, 1936.

(Continued from June number).

President, William T. Davis.
Vice-President, Jose R. de la Torre-Bueno.
Treasurer, George P. Engelhardt.
Recording Secretary, Carl G. Siepmann.
Corresponding Secretary, Frederick Lemmer.
Librarian, Herbert Wilford.
Curator, John M. Sheridan.
Delegate to the New York Academy of Sciences, George P. Engelhardt.

There being no other nominations, a motion was made and seconded that the officers be elected as nominated; the secretary was directed to cast one ballot for their election, and the officers were declared unanimously elected.

Mr. Engelhardt reported that Mrs. William T. Bather, wife of the former President of the Brooklyn Entomological Society, passed away on January 2, 1936, and proposed that the society notify Mr. Bather that the society learned with deepest rgret of the death of Mrs. Bather and extends to Mr. Bather its heartfelt sympathy. The motion was seconded and carried.

The following new members were proposed by Mr. Engelhardt:

Mr. William G. Bodenstein,
Department of Entomology,
Cornell University,
Ithaca, N. Y.
Home Address: 8733 96th Street,
Woodhaven, N. Y.

Mr. Henry J. Dietz,
3220 Decatur Avenue,
Bronx, New York.

The motions were seconded, and the members were elected by unanimous vote.

Mr. Engelhardt read a letter from Pedro Denier, Encargado del Laboratorio de Entomologia del Servicio de Fiscalización Algodonera, Calle Saenz Peña 87, Resistencia (Chaco), Republic of the Argentine, who was interested in obtaining Meloid beetles from the United States by exchange. He also read a letter from Wm. Clarke-MacIntyre, Baños, Province de Tungurahua, Republic of Ecuador, who was anxious to enter into arrangements to collect insects for collectors who wanted material from this locality. Mr. Davis spoke on Cicadas and Cicada Killers, illustrating his talk with photographs and specimens. He prefaced his talk with a reminder that Brood X of the 17-year locust would appear in 1936. In 1919 this brood, which is the greatest brood known, appeared on the south shore of Lond Island, at Freeport, Mastick, Patchogue and below Hicksville. The brood occurs almost all over New Jersey.

Specimens of the Cicada Killer and Cicadas which had been captured by it, were shown. Mr. Davis read an account of the life history and habits of this insect, commenting that the Cicada Killer carries its prey legs up, and not legs down as shown in the figure in Dr. Howard's book, the Cicada being easier to hold in this position. The egg of the Cicada Killer is usually placed under the right middle leg of the Cicada, sometimes the left middle leg. The mating habits of this insect are unusual, the males congregating within a small area and seizing the females as they fly past. The Cicada Killer does not confine itself to one species of Cicada, but will take all species indiscriminatingly. Among other insects which are known to kill Cicadas are the spider, *Miranda aurantia,* which catches the Cicada in its web; *Rehnia speciosa,* the lubber grasshopper, and *Proctacanthus nigriventris* and other Asilid flies. A species of mutilla is said to be parasitic on the Cicada Killer, *Sphex speciosus.*

Mr. Engelhardt exhibited a series of the Clematis borer, *Alcathoë verrugo,* race *californicus* Engelh. This handsome clearwing moth, originally described from Central America, extends its range along the Pacific Coast into southern California as far as Santa Barbara, the northernmost record thus far. Normally deep orange in coloration it was surprising that out of 100 examples, more or less, bred during the past several years, about 30 specimens were glossy black, but there were no transitions to connect the two color phases. The material in hand seemed sufficient to conclude that transition forms do not occur in this species. This conclusion has now been proven to be erroneous. Mr. Theo. W. Hower, of Orange, California, bred a large number of this borer during the summer of 1935, obtaining the orange and black color phases in about equal parts and in addition a limited number of transition forms, beautifully illustrating the gradual blending from orange to black. Mr. Hower's fine series, including his intergrade specimens, were shown.

The meeting adjourned at 10.20 p. m.

CARL GEO. SIEPMANN,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

COLEOPTERA.—Am interested in exchanging Coleoptera. Carl G. Siepmann, R. F. D. No. 1, Box 92, Rahway, N. J.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

HISTERIDAE—Desire to obtain material, all localities, for identification, by purchase or exchange of other families. Chas. A. Ballou, Jr., 77 Beekman St., New York, N. Y.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

FOR SALE.—Indian butterflies, Moths, Sphingidae, Beetles, living Cocoons, etc. For particulars write to The Himalayan Butterfly Co., Shillong, Assam, India.

LOCALITY PIN LABELS, all alike on a strip. Trimmed, one cut makes a label. Best, white linen ledger paper. Smallest type—3-point face. 75c per 1000. Lepidoptera for exchange and sale. C. V. Blackburn, 7 Emerson St., Stoneham, Mass.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of all Technical Terms Used in Entomology. By JOHN B. SMITH, SC.D. (The Glossary.) Out of Print.

Bulletin of the Brooklyn Entomological Society (unbound), vols. 8 to date (per vol.)	2.50
Entomologica Americana, vols. I to date, per volume	4.00
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to LIBRARIAN, Brooklyn Entomological Society, 28 Clubway, Hartsdale, N. Y.

ANNOUNCEMENT.

SMITH'S "GLOSSARY".

The printings of this well-known work are exhausted.

We have in active preparation a new and much enlarged edition. This revision will run to between 5,000 and 7,000 terms, or about two to four thousand more than in the original work. In the 30 years since Dr. John B. Smith prepared this important work, entomology has not only grown, but it has also branched out into other fields—genetics, ecology, and other phases of biology. Every modern text-book is filled with references to these and other cognate branches. Not alone these disciplines mentioned, but also embryology, cytology and the newer work on endocrine glands have much to do with modern entomology which is rapidly passing the descriptive stage pure and simple, if it has not already left it. It must be emphasized that these newer realms of research have a deep taxonomic bearing—such, for instance, as biological or even psychological approaches to the problem of origins and affinities or differences of species.

Biochemistry and biophysics also impinge on the field of entomology.

Consequently, a multiplicity of terms of these sciences is to be found in modern entomological texts and monographs; and not always with any definition or explanation or clarifying context.

A selection of such terms is included, as they occur in entomological works.

A further announcement will be made shortly, giving the approximate time of publication and the price. The first has been tentatively set for the Spring of 1937; and the second at $5. a copy.

Publication Committee of the
Brooklyn Entomological Society.

Vol. XXXI DECEMBER, 1936 No. 5

BULLETIN

OF THE

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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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J. R. de la TORRE-BUENO, Editor,
311 East 4th St., Tucson, Ariz.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXI December, 1936 No. 5

NOTES ON CERTAIN MALES OF NORTH AMERICAN HORSEFLIES (TABANIDAE).

By Cornelius B. Philip, Hamilton, Montana.

Male horseflies are never found in collections in the variety, or abundance of corresponding females owing to their lack of blood sucking propensities and consequent absence about animal or human bait; this difference in habits, together with the infrequency of observed mating and of association of sexes in samples, has resulted in usual description of the females of a given species first. Osten Sacken considered the males often to have the better diagnostic characters, but in certain groups (e.g., the *affinis* group, discussed in a later paper) such homogeneity occurs that the males with their reduced, subovate palpi, more slender antennae, and holoptic eyes eliminating frontal characters, frequently make specific recognition in this sex more difficult, especially in a variety of material where distinctions in size and tinctorial pattern are meagre.

A number of apparently undescribed, or inadequately characterized males, have accumulated over a period of years and it appears opportune to make their descriptions available at this time. In order that initial descriptions of the opposite sex subsequent to the original specific establishment may be associated with a definite specimen, carefully preserved, for later reference and correction if need be, Mutkowsky's original conception when he proposed the term "allotype," is adhered to rather than the subsequent interpretation reflected in Banks and Caudell's "Rules of Nomenclature" of an allotype as a "paratype of the opposite sex." There may easily be (and has been) question of an author's proper interpretation or association of sexes, but there need be no doubt of the issue if the basic specimen is available; definite assignment is equally advantageous for subsequent taxonomic purposes in my opinion, and apparently in that of the author of the term also,

JAN 8 1937

whether such specimen be paratype or not. This is of most importance in the case of easily confused species differentiated to a large extent on frontal characters or minor differences in the antennae and palpi of the females. One need only to refer to the descriptions of male *T. captonis* Mart. by Williston (1886, *T. comastes*) or by Hine (1904) and wonder, without study of the actual specimen before the author, to which of the species of the red-sided group present in the region, the specimen really belonged, to realize the value of this procedure.

Specimens discussed below, unless otherwise indicated, are in the collection of the author. Although size of the appendages of the head may vary slightly among individuals of a given species, measurements of apical palpal and third antennal segments (including annuli) are given to provide a more exact comparison for subsequent use.

> *T. aegrotus* O. S. Williston (1886) only mentions the male in a sentence about the eyes. Readily associated with the female. Head not greatly larger than in the ♀, facets little differentiated, glabrous; antennae more slender (third segment, .6 x 1.38 mm. in height at the basal tooth, by length respectively) but characteristic in shape; second palpal segments moderately swollen, .48 x .84 mm. in thickness and height, with apical, short, downward-pointed nipples. Outer fore tarsal claws slightly longer than the inner.
>
> *T. cymatophorus* O. S. Allotype ♂—21.5 mm. Differs from the ♀ only in the usual sexual characters. Head not greatly larger than in ♀, eyes glabrous, the area of enlarged facets distinct, occupying about 2/3 the total area of the eyes. Antennae relatively slender, dorsally excised on the third segment, light brown, a little darker distally. Apical palpal joints of the same color, and slender (.42 x .96 mm. in length and thickness), scattering black hairs among the white, concentrated mostly on the slightly downward pointed apex. Femora brownish instead of black. Outer fore tarsal claw about 1/6 longer than the inner. Madison Co., Texas, July 17, 1932. H. J. Reinhard.

This sex is not rare in collections and has been reared by Jones and Bradley (1923) and by Schwardt (1931). The pupal case of a specimen furnished by Schwardt, has strongly rugose frontal carinae and disc above, the abdominal fringes complete with 3 sizes of spines not unusually spaced except the longer ones reduced in numbers dorsally on the preanal segment, the latter without a lateral comb, 4–5 spines in the dorso-lateral and about 20 in the ventral combs, and the "aster" hexagonal much as in *T. stygius* Say (see Philip, 1931).

I have seen the males confused with *T. reinwardtii* Wied. but the bare eyes, broader pale incisures and more tapering abdomen, in addition to its more robust build easily distinguish the present species. Cell R_5 of the wings in the 3 males before me is more open than in any of the females studied.

> *T. dorsifer* Wlk. Allotype ♂—13 mm. Tinctorially very similar to the ♀ but darker and more hirsute. Head large, eyes bare, the upper facets distinctly enlarged, occupying about 2/3 the total area of the eyes. Antennae black, but little narrower than those of the ♀. Frontal triangle grayish pollinose, the apex darker and subshining. Apical palpal segments pallid, rather elongate (.33 x .66 mm.) with a slight downward directed, apical nipple, and a few scattering black hairs among the many white ones. Disc of thorax marked as in the ♀ and covered with long, smoky pile and short appressed coppery hairs which also occur on the scutellum posteriorly; anteriorly on the latter, a spot of black pile which extends briefly forward onto the posterior notum. Abdomen more blackish but with the same pattern as the ♀, the pale hairs not complete across the hind margins of any of the segments; first segment almost entirely black except for the white hairs in the middle and on the extreme edge. Venter almost completely covered with white pile except for sparse black ones, caudad of the middle of sternite 4. Grand Canyon, Ariz., Phantom Ranch, about 2500′; July 26, 1934; F. E. Lutz. Obtained through the kindness of Dr. C. H. Curran.

According to notes made by Hine after study of the types at the British Museum, *T. sexvittatus* Big. and *T. hyalinipennis* Hine are synonyms.

> *T. erythraeus* Big. Allotype—13 mm. The antennal structure and tinctorial characters readily associate the two sexes. Head and eye facets not enlarged, with very short, sparse hairs on the eyes. Vertical triangle raised above the upper eye level, brownish pollinose, with long black hairs. Frontal triangle grayish pollinose with a brownish spot across the apex.

First 2 segments of the antennae yellow, with coarse black hairs dorsally and dense black spines on the apex of the first; latter remarkably incrassate, taller by 1/4 than the basal height of the third segment which is contrasting black, yellowish only at the extreme base. Palpi dark basally, the apical joints creamy (.3 x .69 mm.), apically produced downward, with sparse white and a few black hairs. Thorax and appendages as in the ♀, outer front tarsal claws slightly elongated. Abdomen broadly light brownish on the sides, the middorsal and lateral pale spots subobsolete. Venter tan, darker caudally, with a dark central spot anteriorly and pale vestiture. Huachuca Mts., Ariz., July, 1928, F. M. Andrews.

According to Hine, *T. rubescens* Bell. is a synonym (see Philip, 1936) and *T. abactor* Philip from Texas and adjoining states has been confused with *erythraeus,* but its hairy eyes (though short and sparse), very swollen basal antennal segments, and dark thorax distinguish it. The females are without any evidence of ocellar tubercles on the vertex, all of which, according to Stone (correspondence), places the species in *Poeciloderas.*

T. fratellus Will. Allotype ♂—10.5 mm. Readily associated with the ♀ except the head much larger, the body more shining and hirsute, brownish, with the gray maculations of the thorax and abdomen reduced. Eyes bare, area of enlarged facets distinct, about 2/3 the total area. Vertical tubercle reduced considerably below upper eye level. Frontal triangle narrowly grayish pollinose above insertion of the antennae, upper portion shining brown, denuded. Antennae dark brownish, shaped as in the ♀ but a little narrower, third segment .27 x .78 mm. Palpi yellow, rather slender (length and thickness, .27 x .51 mm.), a few black hairs apically among the white. Dorsum of thorax with long, cinereous pile, and pleura and coxae with contrasting whitish pile. Legs more brownish than in the ♀. Abdomen almost black with dark pile and contrasting, narrow pale incisures; no evidence of middorsal spots, the lateral ones very reduced. Douglas, Alaska, July 26, 1901.

I have females varying up to 12 mm. in length. They appear in the Northwest in latter July and August.

T. gladiator Stone. Allotype ♂—21 mm. Agrees closely with the recently described ♀ except for the usual sexual differences. Head rather small, eyes glabrous, differentiation of facets not apparent. Antennae of characteristic shape and color, the third segment more slender (.54 x 1.38 mm.) basally, subequal in height to the first segment distally. Palpi very dark, slender, covered with black hair, the apical segment .9 x .36 mm. in length and thickness. Tongue rather long. Fore tarsal claws subequal. The median black spots on abdominal tergites 2 to 4 accentuated, touching the anterior border only on 2. Cell R_5 not as coarctate as in the females studied. Columbia, So. Car., Aug. 19, 1927, A. L. Cook.

Two other males in the Univ. of Kan. collections agree closely. The appearance is somewhat that of *T. sulcifrons* but lack of enlarged eye facets and smaller abdominal and wing maculations readily separate it.

T. melanocerus Wied. Allotype ♂—.14 mm. Like the ♀ but the head much larger, the abdomen smaller, more pointed in proportion, and a more brownish cast to the whole body. Eyes glabrous, area of enlarged facets occupying about ¾ the total area, flattened on the disc. Antennae, dark brownish, the third segment (.36 x 1.08 mm.) slightly excised and yellowish on the extreme base. Apical palpal articles subpyriform (.45 x .9 mm.), thickest in the distal half, yellowish, bluntly rounded with sparse black and white pile. Frontal triangle with the apical half brown, contrasting sharply with the pale lower portion above the antennae. Tibiae with the distal infuscation much more extensive especially on the fore pair and cell R_5 of wings more open than in the ♀'s studied. Outer fore tarsal claw slightly elongated. The abdominal triangles are comparable but the pale incisures much less evident both dorsally and ventrally. Lakehurst, N. Jersey, July, 1911, Wm. T. Davis. Determination by Stone.

A male was also reported, but not described, by McAtee and Walton (1918) from Virginia.

T. proximus Wlk. Allotype ♂—21.5 mm. Agrees closely in appearance and color detail with the ♀. Head larger, eyes bare, the area of enlarged facets distinct, about 2/3 of the total area and moderately flattened on the disc. Antennae and palpi of the same color as in the ♀, the apical segments of the latter 1.02 mm. in length and .48 mm. in thickness just beyond the middle, while the third antennal segment is .54 x 1.47 mm. Outer fore tarsal claws moderately elongated. Cell R_5 of wings not as coarctate as in the females examined. Rock Island, Texas, July 17, 1922, Grace O. Wiley.

The combination of enlarged eye facets, reddish antennae, dark palpi and femora, and maculate wings will distinguish this form related forms.

T. pygmaeus Will. Allotype ♂—7 mm. Head very large, eyes bare, the area of enlarged facets occupying almost 4/5 of the total area, pale, the dark lower area of smaller facets not following upward along the outer margin in the usual manner. Vertical tubercle (triangle) vestigial, reduced considerably below the eye level. Frontal triangle cinereous on its lower 2/3, concolorous with the antennae. Third joint of latter broad (.24 x .48 mm.), not dorsally excavated, annulate portion short (.18 mm.), the first annulus tall, as though an integral part of the third joint, the second very distinct, the apical small and conical. Face whitish pollinose and pilose. Palpi creamy, the second joints hardly enlarged, (.06 × .12 mm.) conical, covered with white hairs and an occasional black one apically. Thorax and appendages as in the ♀. Abdomen dark brownish, yellowish laterally on the first 2 tergites and narrow, pale incisures, pattern indistinct in consequence of rubbing. Kissimmee, Florida, July 13, 1914. Rev. J. D. McBain, through Mr. Floyd Carroll.

T. sparus Whit. Allotype ♂—10.5 mm. Compared with *pumilus,* Macq., body more robust, abdomen less tapering caudad and less brownish, the triangles more prominent and laterally more oblique, and eyes (relaxed) without purple stripes. Head large, area of enlarged facets strongly delimited, brown, and occupying about 2/3 the total eye area; vertical tubercle small, sublinear, and depressed; frontal triangle brown, gray in the apex and crossed by a dark band continuous with the upper limit of small facets of the eyes. Antennae dark brown, practically concolorous, slightly paler distally on the annuli. Face and cheeks whitish with white pile; palpi yellowish, rather slender and slightly downward pointed apically, almost no black hairs discernible. All femora black with grayish pollinosity, and fore tibiae and tarsi contrasting black distally (in *pumilus* this is only evident by difference in color of the vestiture, hardly of the integument), hind tibial fringe and other hairs except extreme apex white; outer fore tarsal claw only slightly elongated. Queens, Long Island, 5–24–1919, F. M. Schott. In the collection of Dr. J. Bequaert.

The legs of *pumilus* are more uniformly reddish with more evidence of black hairs on the hind tibiae. Doubt concerning the validity of Whitney's *sparus* and *milleri* from *pumilus* was raised by Bequaert (1934), but it may be added that all the females of the latter studied by me were not only distinguished by the two eye bands (relaxed), but the median, frontal callus was broad (not linear) and detached from the callosity below the antennae bright red with black annuli rather than uniformly brownish, the palpi less swollen basally and more bluntly rounded apically, the femora reddish, and the abdominal spots usually more rounded and isolated. If *milleri* is distinct from *sparus* it is only on the presence of an eye-stripe in life as mentioned by Whitney. I have *milleri* from as far north on the Atlantic Coast as New York and as far west as Oklahoma and Kansas.

T. trijunctus Wlk. Allotype ♂—17.5 mm. Similar to the female in color and markings. Head moderately large, eyes bare, enlarged facets pale (dried) occupying less than $\frac{2}{3}$ of total area and slightly flattened. Frontal triangle yellow pollinose, brown over apical half. Antennae bright red, third segment strongly excavated, .51 × 1.5 mm. in height and length. Palpi fuscous, rather slender, apical segments, .42 × 1.11 mm. Homestead, Florida, June 25, 1918, C. A. Mosier through kindness of the late Professor Hine.

T. turbidus Wied. Allotype ♂—20 mm. Head very large, eyes bare, enlarged facets occupying about 3/4 the total area. Vertical tubercle small, not denuded, reduced below the upper level of the eyes. Antennae deep brown, like those of the ♀ in shape, but more slender, the first segment distally, a little taller than the third segment at the dorsal prominence. Palpi dull brownish, a little swollen (.48 × .96 mm.), apically pointed, and covered with long blackish hairs. Face, legs and remainder of the body more or less concolorous, dull brown, the middorsal abdominal triangles indicated by indefinite grayish pollinose patches, and no pale borders discernible. The wings appear somewhat teneral, and lack of suffusion bordering the veins seen in the ♀. Florida, through Ward's Natural Science Establishment. No date.

T. zonalis Kby. Allotype ♂—17 mm. Not materially different from the ♀ except for the almost white and rather narrow abdominal bands which are usually yellow and broader in the ♀. Head subequal in size to that of the ♀ the eyes densely hirsute and facets uniform; vertical triangle denuded and raised above the upper eye level; frontal triangle silvery pollinose. Palpi almost black, covered with black hairs, the apical joints .36 × .75 mm. Outer front tarsal claws slightly elongated. International Falls, Minn., July 3–5, 1924. C. B. Philip, taken while dipping at a roadside pond.

This is one of 2 specimens briefly referred to by me (1931). It should not be confused with *T. nigrotuberculatus* Fchld. with its black antealar tubercles.

Silvius sayi Bren. Allotype ♂—7 mm. Readily associated with the recently described female by the accentuated wing maculations and the infuscated costal cell. Abdomen laterally and legs with extensive yellowish suffusion, the central pairs of spots largest anteriorly, the lateral spots missing on the second tergite. Venter more or less clouded, the 3 rows of spots rather obscure. Proboscis very long and slender, the palpi minute and dark. The maculations behind the stigma confluent and the costal margin beyond the stigma narrowly infuscated. College Station, Texas, May 28, 1928.

I have another male collected in Galveston in May by F. H. Snow, and a female from Brownwood in August, both from Texas.

Esenbeckia delta Hine. The original description was based on 2 males, although the describer gives the length as that of the female. This must have been an error as no specimens of the latter sex have been previously available. I have studied 3 females also from Southern Arizona, one of which is here described as allotype.

Length, 16 mm.; essentially of the same diffuse, pale brownish coloration of the male. Front narrow, yellowish pollinose, excavated ventrally and with a mesal ridge running upward; 2 ocelli distinct and raised on a dark tubercle. Antennae entirely bright yellow, the apical annulus very slender, elongated and slightly clavate distally. Proboscis slender, subequal in length to height of head, labellae small, palpi yellowish, slender, covered with short black hairs except the lateral furrows in the apical joint. An indistinct row of elongated, middorsal spots on each adbominal tergite. Wings with a uniform dilute, suffusion and a pronounced spur at the fork of R_5. Femora a little darker than the rest of the legs. Douglas, Ariz., Aug. 21, 1933, through the kindness of Mr. Wyatt Jones.

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Microbembex and Chrysopa.—Last July, while staying in a wooded region near Michigan City, Indiana, I saw a *Microbembex* carrying a green lace-wing (Chrysopa). Evidently frightened by my approach, the wasp disappeared and did not return. Examination showed that the *Chrysopa* was quite dead. Now it is known that *Microbembex* habitually attacks small Diptera. It has also been taken for granted that the prey of solitary wasps is recognized by its form or odor; prehaps by both. The question raised by this case is this: since *Chrysopa* resembles the Diptera neither in form nor odor, why was it attacked by *Microbembex?* It might prove interesting to scatter some specimens of *Chrysopa* over bare sandy areas (where they are not usually found), to discover if the *situation* has anything to do with the matter.—CYRIL E. ABBOTT, Chicago, Ill.

STUDIES IN THE NYSSONINE WASPS.

II. THE SUBGENERA OF SPHECIUS (HYMENOPTERA: SPHECIDAE: GORYTINI).

By V. S. L. Pate, Cornell University, Ithaca, N. Y.

Recently while making a study of the taxonomy and generic nomenclature of the Gorytine complex, there was an opportunity to survey the classification of the cicada-killers of the genus *Sphecius*. So far as I am aware, Rohwer[1] was the first to call attention to the fact that this genus belongs to the Nyssonids rather than to the Stizine-Bembicine group, although it is probably from some such ancestral type as this that these latter groups have evolved. *Sphecius* is unquestionably a Gorytine and according to the structure of the mesopleura and the head is related to *Tanyoprymnus* Cameron, albeit rather remotely. There is no basis, however, for creating a separate tribe for its reception as Rohwer has done.

Sphecius Dahlbom.

1844. *Sphecius* Dahlbom, Hymen. Europ., I, p. 154.
    Type: *Sphex speciosus* Drury, 1773 [=*Sphecius speciosus* (Drury)]. (Monobasic).

1845. *Hogardia* Lepeletier, Hist. Nat. Insect., Hymen., III, p. 289.
    Type: *Hogardia rufescens* Lepeletier, 1845 [=*Stizus Hogardii* Latreille, 1809=*S.* (*Sphecius*) *Hogardii* (Latreille)]. (Absolute tautonymy.)

1879. *Sphecienus* Patton, Bull. U. S. Geol. Surv., V, p. 345.
    Type: *Stizus nigricornis* Dufour, 1838 [=*Sphecienus nigricornis* (Dufour)=*Sphecius* (*Sphecienus*) *nigricornis* (Dufour)]. (Original designation.)

Within the genus there are several discrete groups. The typical *Sphecii*, of which *Hogardia* Lepeletier is a synonym, are to be found only in the New World. In 1879 Patton proposed *Sphecienus* for the reception of the Palaearctic species but subsequent authors have followed Handlirsch in suppressing Patton's name as a mere synonym of *Sphecius*. This has probably been due to the fact that Patton in his original description gave only the characters of the males. The females, however, possess characters quite as excellent as those of the males and I therefore feel there is ample evidence, as presented in the following analytical table, for retaining *Sphecienus* at least as a subgenus for the palaearctic species.

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[1] Proc. U. S. Nat. Mus., 1921, LIX, p. 403.

However, if this course is followed, it is necessary to accord some recognition to the Malagasy, Æthiopian and Australian forms which constitute a distinct group somewhat intermediate between the typical New World *Sphecius* and the Palaearctic *Sphecienus*. While some of the characters of this complex may seem at first glance to be rather trivial ones, nevertheless, I feel certain, particularly in view of the geographic distribution of the group, that it merits subgeneric rank.

Nothosphecius new subgenus

Type: *Stizus grandidieri* Saussure, 1887.

The diagnostic pattern of *Nothosphecius* is a very interesting one. The males seem to be midway between *Sphecienus* and *Sphecius*, having in common with the former the curved and excavate last flagellar article and agreeing with the latter in the simple middle metatarsi. The females, on the other hand, seem to be more closely related to *Sphecius* than to *Sphecienus*, possessing in common with the former the same type of calcaria on the hind tibiae. The females of *Nothosphecius*, however, may be readily distinguished from those of *Sphecius* by the fact that only the first segment of the middle tarsus is asymmetrical whereas in *Sphecius* the first two segments are asymmetrical. Moreover, the disc of the clypeus of *Nothosphecius* is flattened and bevelled laterally, while in *Sphecius* the clypeus is tumid discally with little or no suggestion of medial flattening or lateral bevelling.

The following analytical table will serve to characterize *Nothosphecius* and to differentiate it from *Sphecius* and *Sphecienus*.

Subgenera of *Sphecius*.

a. Males with the first segment of the middle tarsi simple and the last segment of the antennae simple, not excavate beneath, the last two segments as thick as the preceding segments of the flagellum; females with the calcaria of the hind tibiae flattened, the shorter one broad and spatulate, the longer one broad and strongly falciform, the first two segments of the middle tarsi strongly asymmetrical, produced outwardly at the apex and ending there in a thick spine; clypeus tumid discally; New World forms.
Sphecius Dahlbom.

b. Males with the first segment of the middle tarsi simple but with the last segment of the antennae excavate beneath and curved, the last two flagellar articles abruptly thinner than the preceding segments; females with the calcaria of

the hind tibiae quite similar to *Sphecius,* flattened, the shorter one spatulate, the longer one falciform, but with only the first segment of the middle tarsi strongly asymmetrical, produced outwardly at the apex and ending there in a thick spine, clypeus flat discally and bevelled off at the sides; Malagasy, Æthiopian and Australian forms.
Nothosphecius new subgenus.

c. Males with the first segment of the middle tarsi dilated basally, semicircularly excavate and with an unciform lamellate process, the last segment of the antennae curved and excavate beneath; females with the calcaria of the hind tibiae simple, acuminate, not flattened, clypeus somewhat flattened discally and slightly bevelled at the sides, first two segments of the middle tarsi strongly asymmetrical, produced outwardly at the apex and ending there in a thick spine; Palaearctic forms .... *Sphecienus* Patton.

BROOD 10.

This promises to be a boom year for seventeen-year locusts, so you might as well know all about them. We know all about them because we went over to Staten Island and talked with William T. Davis, a small, shy, grizzled man in his seventy-fourth year who has more knowledge of locusts than anybody else in the country, probably. Knows better than to call them locusts, for one thing. They're cicadas. The Biblical locusts which plagued Pharaoh were a species of grasshopper; the early Americans, weak on entomology and always on the lookout for portents, got cicadas and locusts mixed up. Cicadas aren't so dangerous to vegetation, Mr. Davis says. This year's batch of locusts (we'll call them that, because you and all your friends will, anyway) is known to the Department of Agriculture as Brood 10. That's the same Brood 10 that raised such hell around here back in 1919, getting wedged into the radiator fronts of automobiles, sticking on fresh paint, and falling into pans of Jell-O cooling on the back porch. Every cycle of locusts has its own number. They turn up every year, in one part of the country or another, but Brood 10 is about the most numerous in the East. It will be thick in Ohio, Indiana, parts of Illinois, New Jersey, and in some counties of New York: Columbia, Kings, Nassau, Queens, Richmond, and Suffolk. The insects aren't expected in the city, and if any strays appear the sparrows will take care of them. Birds are great enemies of locusts, and so are cats and pigs.

Mr. Davis told us about the life of a locust, which is fascinating if you don't have to lead it. They spend sixteen years and some odd months of their life underground, sucking the juice from the roots of plants and trees. That's all they do—suck and suck, like a man with a malted milk. Then, sometime in May or early June, the seventeen-year-old grubs all come to the surface, cast their pupal skins, and start dating one another up. There ensue a few weeks of great activity, with the locusts mating, cats and pigs eating the locusts, and Mr. Davis almost going mad with excitement. It's all over by the Fourth of July: the females have laid their eggs in the bark of trees; the grubs have hatched out, dropped to the ground, and burrowed under; and the parents have died. In Mississippi and Louisiana the seventeen-year locusts appear every thirteen years. Nobody knows why. Mr. Davis would know if anybody knew, and he doesn't.

It was back in 1877, when Mr. Davis was only fourteen years old, that he first became interested in locusts. He woke up one morning and found Staten Island crawling with them; right then he knew that locusts were going to be his life-work. Until 1909 he worked in the New York Produce Exchange, in his spare time peering at locusts through a microscope, shooting rare specimens out of trees with bird shot in a sling; then he retired and went at the thing full time. Of the hundred-and-seventy-odd species of North American cicada, Mr. Davis has discovered and named over half. He's president-emeritus of the Staten Island Institute of Arts and Sciences, and has got together for it one of the best cicada collections in the world. He's also a fellow of the Entomological Society of America and past president of the New York Entomological Society. He is, of course, steeped in cicada lore—told us that among the American Indians they were a staple article of diet, and that the early settlers in Pennsylvania had tried them and left statements that they were as "succulent as oysters." However, that's just lore as far as Mr. Davis is concerned; he's never tried them.—*Reprinted by permission from The New Yorker.*

NOTES ON CLIMACIELLA BRUNNEA VAR. OCCIDENTALIS BANKS (MANTISPIDAE–NEUROPTERA).

By Clarence H. Hoffmann, Morristown, N. J.

On July 16, 1933, Mr. W. B. Owen collected an adult female of *Climaciella brunnea* var. *occidentalis* Banks (Det. A. N. Caudell) on vegetation along the shore of Bay Lake, Crow County, Minnesota.

This female, which was confined in a pint glass fruit jar kept in a basement room with a temperature of approximately 23° C., deposited 1,028 eggs on July 16th on one side of the glass container. In most instances, the eggs were laid side by side in long curved rows, and the entire lot occupied a space that measured 19 by 12 mm. The eggs, which were laid singly, were attached to fine stalks, the opposite ends of which were firmly embedded in a copious circle of mucilaginous secretion. Before hatching the rigid stalk maintained the eggs in an upright position, but following hatching the stalk became kinked. The eggs of this species are elongate-oval, average 0.6 mm. in length, 0.3 mm. in width, and are light salmon in color. A small but distinct micropyle is present on the upper end of the egg. The slender stalk, which varies from .51 mm. to .75 mm. in length, is not discernible to the naked eye.

Smith [Jour. Kansas Ent. Soc. 7(4): 123. 1934] found that the average number of eggs laid by females of *Mantispa brunnea* Say was 250 per female, and that hatching occurred 11 days later. Hatching of the 1,028 eggs of *C. brunnea* var. *occidentalis* Banks kept under observation began on August 11th, 26 days after deposition. Only 6 eggs of this batch failed to hatch. The newly hatched larvae clustered about the empty egg shells for about a day, but they did not feed upon them. Subsequently, they dropped to the bottom of the fruit jar and mingled with the provided leaves and vegetable mold. These tiny brown larvae are very active and quite acrobatic. After walking a short distance, it is not uncommon for the larvae to attach themselves to a substratum apparently by means of caudal appendages and stand upright, pivot, wave the body excitedly in a horizontal plane, or even lean backwards so far as to almost make the body a right angle.

Spider eggs were not available at the time, so an attempt was made to get the small larvae to feed upon mealy-bug eggs, but they rejected this food. By August 28th only 4 larvae were alive, but this might well be expected since the leaves and vegetable mold used in the container became desiccated. The 4 larvae were re-isolated in a salve tin and kept at 7° C., where, with little care, they lived until late December. These observations suggest that the larvae overwinter free and fast until spring or early summer, at which time they probably enter certain spider egg-sacs. If this is true, the life cycle of this species is probably similar to that of the European species *styriaca,* which was solved after 17 years of observations and study by Brauer (Verh. d. Zool. Bot. Ges. Wien. 19: 831–840, 1 pl. 1869).

LOCAL IRRITATION AND OLFACTORY RESPONSE.

By Cyril E. Abbott, Chicago, Ill.

A complaint often made against using certain chemicals for the testing of feeding responses of insects is that these are or may be irritating, consequently the responses of the insect are not the result of olfaction. For many years no one has offered any criterion or method of measurement by which these two stimuli may be separated. Yet the answer is very simple: determine the toxicity of the substance for the insect. This is not an absolute differentiation because some insects react positively to toxic substances, while other non-toxic substances initiate no responses. Yet it is a fair assumption that if the substance is not toxic and yet initiates a response, the latter must be olfactory. For instance, some specimens of *Lygaeus kalmii* used recently in experiments, gave feeding responses in a vapor of citral. That this is *not* due to irritation is indicated by the fact that when several of the insects were confined for over half an hour in a saturated atmosphere of the substance they remained active, and after being released in another cage exhibited no ill effects from the citral. The mere fact that an insect gives a *negative* response to a substance does not indicate, however, that the substance is toxic. *Lucilia sericata* gives an avoiding reaction to caproic acid in strong concentrations; yet will live for a long time in a concentrated atmosphere of this substance.

Please: Send in your renewal for 1937 (Vol. XXXII) on the enclosed form.

A PRELIMINARY REPORT OF THE MYCETOPHILIDAE OF NORTH AND SOUTH CAROLINA.

By F. R. Shaw and H. K. Townes, Jr., Amherst, Mass.

During the years 1931–1933, a considerable number of mycetophilidae were collected by H. K. Townes, jr., in North and South Carolina. The specimens were all taken by sweeping with a net along the banks of woodlands streams. Unless otherwise stated all localities are in Greenville Co., South Carolina. Many of these species have not been recorded from either of the states in any previous papers and inasmuch as some species are new, a preliminary report was considered to be in order.

The arrangement of subfamilies and tribes is that suggested by F. W. Edwards in 1924 in his paper on British Fungus Gnats.

Subfamily Bolitophilinae.

Bolitophila hybrida Meig.—
Cedar Mt., N. C., Big Pisgah Mt., Haywood Co., N. C., 2700–4000 feet. July 19–August 24.

Bolitophilella cinerea Meig.—
Greenville, CalahanMt., 900–1300 feet. February 26–May 22.

Subfamily Diadocidiinae.

Diadocidia borealis Coq.—
Old Indian Mt., Big Pisgah Mt., Haywood Co., N. C., 1200–1400 feet. July 16–19.

Diadocidia ferruginosa Meig.—
Old Indian Mt., 1400 ft., June 13.

Subfamily Ceroplatinae.

Ceroplatus clausus Coq.—
Greenville, 950 feet. September 18.

Platyura apicalis Shaw—
Banks of North Saluda River at Old Indian Mt., Greenville, 900–1100 feet. June 4–13.

Platyura divaricata Loew—
Cedar Mt., N. C., 2700 feet. August 24.

Platyura elegans Coq.—
Venus, Greenville; Old Indian Mt., 900–1300 feet. May 30–July 20.

Platyura inops Coq.—
Venus, Old Indian Mt., Cedar Mt., N. C., 1100–2900 feet.

June 13–July 14. Greenville, 1000 feet. June 3.

Platyura mendosa Loew—
Old Indian Mt. May 31.

Platyura subterminalis Say—
Greenville, Old Indian Mt., 900–1200 feet. May 14–18.

SUBFAMILY MACROCERINAE.

Macrocera clara Loew—
Old Indian Mt.; Paris Mt.; Greenville, 900–1400 feet. May 4–31.

Macrocera fisherae Shaw—

Macrocera floridana Johnson—
Greenville; Paris Mt.; Old Indian Mt. 900–1700 feet. March 29–October 23.

Macrocera formosa var. *indigena* Joh.—
Old Indian Mt.; Greenville; River Falls 900–1600 feet. May 22–September 1.

Macrocera immaculata Johnson—
Greenville, 900 feet. May 4–18.

SUBFAMILY MYCOMYIINI.

TRIBE MYCOMYIINI.

Mycomyia mendax var. *b*. Joh.—
Mt. Lake Colony; Greenville, 1100–1800 feet. April 9.

Mycomyia obliqua Say—
River Falls; Old Indian Mt., 1200–2800 feet. June 14–October 2.

Mycomyia littoralis var. *frequens* Joh.—
Cedar Mt., N. C., 2900 feet. July 1.

Mycomyia parascopula Fisher—
Old Indian Mt., 1200 feet. June 11.

Mycomyia sequax Joh.—
Greenville; Old Indian Mt., 950–1300 feet. February 26–May 31.

Mycomyia tanilla Loew—
Big Pisgah Mt., N. C., 400 feet. July 19.

Neoempheria illustris Joh.—
Greenville, 900 feet. May 4–18.

Noempheria impatiens Joh.—

TRIBE SCIOPHILINI.

Neuratelia scitula Joh.—
Greenville, 900 feet. May 4–18.

Neuratelia sylvatica Joh.—
Old Indian Mt. May 31.
Syntemna polyzona Loew—
Greenville, 900 feet. April 19.
Paratinia recurva Joh.—
Old Indian Mt., 1200–1400 feet. October 2.
Phthinia tanypus Loew—
Old Indian Mt.; Greenville; River Falls; Cedar Mt., N. C., 900–2700 feet. July 24–September 30.
Sciophila habilis Joh.—
Greenville, 1000 feet. April 15.

TRIBE GNORISTINI.

Boletina tricincta Loew—
Old Indian Mt., 1200 feet. April 14.

TRIBE LEIINI.

Leia decora Loew—
Greenville, 900 feet. June 4.
Tetragoneura pimpla Coq.—
River Falls, 2800 feet. October 2.

Subfamily Mycetophilinae.

TRIBE EXECHINI.

Exechia auxilaria Joh.—
Old Indian Mt., 1200 feet. April 1.
Exechia cincinnata Joh.—
Old Indian Mt., 1200 feet. April 1.
Exechia palmata Joh.—
Greenville, 900 feet. March 23.
Exechia umbratica Aldrich—
River Falls, 2800 feet. October 2.

TRIBE MYCETOPHILINI.

Phronia insulsa var. *a.* Joh.—
Old Indian Mt., 1200 feet. July 16.
Dynatosoma fulvida Coq.—
Old Indian Mt., 1200 feet. September 1.
Mycetophila bipunctata Loew—
Greenville, Big Pisgah Mt., N. C., 900–4000 feet. May 18–July 19.

Mycetophila falcata Joh.—
Greenville, 900 feet. May 18.
Mycetophila fungorum DeG.—
Paris Mt., Greenville, 900–1400 feet. February 26–June 18.
Mycetophila imitator Joh.—
Greenville, Old Indian Mt., 900–1200 feet. March 23–May 19.
Mycetophila inculta Loew—
Greenville, 900 feet. May 4–September 7.
Mycetophila monochaeta Loew—
Old Indian Mt., Greenville, 900–1200 feet. February 26–June 13.
Mycetophila perita Joh.—
Greenville 900 feet. June 11.
Zygomyia ignobilis Loew—
Old Indian Mt., 1200 feet. June 13.
Zygomyia ornata Loew—
Big Pisgah Mt., N. C., 4000 feet. 7–19.
Epicypta punctum Stann.—
Old Indian Mt., Greenville, 900–1200 feet. May 4–June 13.

SUBFAMILY SCIARINAE.

Sciara townesi Shaw—
Greenville Co. along stream near Highway between West Greenville and Easley, S. C., 900 feet. May 18.
Sciara ochrolabis Loew—
Cedar Mt., N. C., 2800 feet. July 28.

In addition to the material studied in the preparation of this paper, the following list of species from North Carolina and South Carolina was obtained from Dr. O. A. Johansen's "Mycetophilidae of North America".

Paltyura genualis Joh.	North Carolina
Tetragoneura nitida Adams.	Lake Toxaway, North Carolina.
Neoempheria nepticula Loew.	Valley of Black Mountins, N. C.
Neomepheria impatiens Joh.	North Carolina July
Neoempheria indulgens Joh.	Black Mountains, N. C.
Mycomyia sigma Joh.	Black Mountains, N. C.
Acnemia sigma Joh.	Black Mountains, N. C.
Leia striata Loew	North Carolina
Exechia canalicula Joh.	North Carolina
Mycetophila fungorum (-*punctata* Meig.)	North Carolina

Mycetophila mutica Loew	North Carolina
Mycetophila lenta Joh.	North Carolina
Sciara picea Rübsaamen	North Carolina
Sciara habilis Joh.	Black Mountains, N. C.
Sciara coprophila Lint.	Black Mountains, N. C.

SOME FOOD-PLANTS OF BUGS

By J. R. de la Torre-Bueno, Tucson, Ariz.

Alydus conspersus Mont., on red clover, at Cayuga Heights, Ithaca, N. Y., July 13, 1919.

Eustictus necopinus Knight, on small aspens on a hot and dry spot in Thompson's Marsh (by the city of White Plains water pumping station and below the local reservoir), July 4, 1919. This is the type locality for the species and the specimens in question were the type specimens.

Halticus citri Ashm.—White Plains, N. Y., Aug. 18, 1918, so abundant on morning glory as to bleach the leaves; Monarat, Va., Aug. 30, 1918, on pokeberry, leaves bleached.

Diaphnidia capitata Van D., from butternut, at Cold Spring Harbor, N. Y., July 31, 1920; according to the N. Y. State List, this appears to be a new food plant.

Diaphnidia pellucida Uhler and *D. provancheri* Burque, both from maple (Acer sp.) in White Plains, N. Y., July 27, 1919; the former also from pussy-willow on July 5, 1920.

Reuteria irrorata Say, White Plains, N. Y., Aug. 15, 1917, on hazel (*Corylus avellana*), a food plant apparently not as yet reported.

Lygus fagi Knight, from dogwood, White Plains, June 28, 1919.

Neurocolpus nubilus Say, abundant as adults and nymphs on poison sumach, High Hill, L. I., N. Y., Aug. 2, 1919, which seems to be an unrecorded food plant; also adults and nymphs, in their season, on elder (*Sambucus*), in great abundance, at Lake Waccabuc, Westchester Co., N. Y. and at Onteora Park, N. Y.

Alydus on Carrion—In White Plains, N. Y., on July 15, 1917, a specimen of the common *Alydus eurinus* Say was picked up on a bone, *sucking* at the joint cartilage.—J. R. de la Torre-Bueno, Tucson, Ariz.

A POPULATION STUDY OF CACOECIA CERASIVORANA FITCH WITH SPECIAL REFERENCE TO ITS INSECT PARASITES (TORTRICIDAE–LEPIDOPTERA).*

Clarence H. Hoffman, Morristown, New Jersey.

During the early summer of 1932, a number of nests containing *C. cerasivorana* larvae were collected on choke-cherry near St. Paul, Minnesota. These nests were placed in breeding cages in a basement room, which was maintained at a temperature of about 23° C., and soon thereafter adults of this species as well as many of its parasites began emerging. The fact that the empty pupal skins are left projecting from the nest, following moth issuance, suggested that if collections were made at the right time, one could make an accurate count of the total population of moths emerging from the nests, the number of living larvae, the parasites, etc. In this way, it would be possible to make a quantitative population study of this species in a given micro-habitat, the insects having been subjected to the natural conditions of their environment.

Literature and Notes on C. cerasivorana.—As determined by Weed (1900), the eggs are laid in summer in flattened masses on the bark of choke-cherry near the ground, and after assuming a dark brown color they are difficult to distinguish from the bark. The eggs hatch in the spring and the larvae construct their nest which is usually cone-shaped. The nests observed by the writer along a roadside near St. Paul, Minnesota, varied greatly in size and usually enveloped an entire branch or a group of branches of the choke-cherry. In several instances webs, inside of which the larvae fed, encircled an entire shrub. Although the choke-cherry is the principal food plant, this species also feeds upon wild cherry, apple, raspberry (Patch, 1907), garden cherry, and birch (Britton, 1912). Patch (1907) collected a newly hatched colony on choke-cherry at Portland, Maine, on June 20 and another on wild cherry at Orono on June 12. The larvae of both were reared in the insectary on apple leaves and the moths developing from the first colony had mostly emerged by August 6, while those of the second colony emerged August 5 to August 12.

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* The writer is indebted to C. F. W. Muesebeck, R. A. Cushman, and A. B. Gahan for the identification of the hymenopterous parasites; to D. G. Hall for the identification of the dipterous parasites, and to A. Busck for confirming the identification of the moth.

On June 18, 1932, I collected several nests on choke-cherry near St. Paul, Minnesota. Some adult moths had already emerged from these nests under field conditions, but most of the inhabitants were in the larval stage. An examination of one nest revealed 250 larvae. The other nests were isolated at 23° C. Most of the larvae pupated by June 23, and moth emergence was heaviest from July 6 to July 15. Just before pupation, the larvae congregate in the center of the nest, usually in the fork of a branch, to spin rather loose cocoons. Later, the pupae work their way out and hang suspended from the outer portion of the nest. Following emergence of the adults, the pupal skins remain projecting from the nest. There is only one generation each year.

Literature on Parasites of C. cerasivorana.—Patch (1907) took *Pimpla conquisitor* at the nest of this tortricid on July 23 at Portland, Maine. She reared *Exochus albifrons* Cr. from nests received from Otisfield; *Labronchus* sp. from nests collected at Otisfield, Waldoboro, and Orono; and large numbers of a dipterous parasite, *Dichaetoneura leucoptera* Johnson, from nests collected at various localities.

Methods and Results of Population Study.—Forty-three nests of *C. cerasivorana* were collected on July 11, 1932. They represented the entire population present in a group of choke-cherry shrubs within a thirty-five foot length of roadside. Thus, by this late date, most of the moths had already emerged under the natural conditions of their environment. The branches supporting these nests were placed in water and kept in a room at 23° C. to enable more adults to emerge and to secure parasites of the species by means of mass rearing. On July 16, the webs were placed in a Carrier cabinet regulated at 12° C. to retard the emergence of the parasites until time was available to examine the material. Within a week afterward, all of the webs were carefully dissected and a count of the population taken. Moreover, a large number of larvae and pupae of different parasites were isolated individually in small vials and reared to maturity.

This colony of *C. cerasivorana* comprising 9,255 individuals subjected to the above methods gave the following results: adult emergence, 4102 or 44.3 per cent; live pupae, 271 or 2.9 per cent; dead pupae, 3657 or 39.5 per cent; live larvae, 68 or .7 per cent; dead larvae, 320 or 3.5 per cent; hymenopterous parasites, 285 or 3 per cent, and dipterous parasites, 552 or 6 per cent.

Dipterous Parasites.—Calculations based on 403 specimens show that about 94 per cent of the dipterous parasitism of *C. cerasivorana* was due to *Nemorilla maculosa* Meig. Emergence of the latter under laboratory conditions began on July 9 and terminated on July 31; the largest numbers emerging from the 12 to the 20. *Phorocera tortricis* Coq., which accounted for about six per cent of the dipterous parasitism of this ugly-nest caterpillar, emerged intermittently from July 12 to July 31. Another dipteron obtained from a *C. cerasivorana* nest (mass rearing) was *Schizocerophaga leibyi* Tns. One puparium was formed on July 14 and the adult emerged on July 24, 1932.

Hymenopterous Parasites.—According to the results of this population study, hymenopterous parasitism amounted to three per cent. One of the most common hymenopterous parasites reared was *Dibrachys cavus* (Walk.). This species spends eight or nine days in the pupal stage, irrespective of host, at 23° C. *Dibrachys cavus* is not only a primary parasite of *C. cerasivorana* but also a secondary parasite, inasmuch as it attacks *Phorocera tortricis, Nemorilla maculosa,* and probably *Itoplectis conquisitor* (Say), all of which are primary parasites of the ugly-nest caterpillar. Adult emergence of *D. cavus* from all hosts started on July 23 and concluded August 10, 1932. The mean number of adults reared from 28 individuals of *C. cerasivorana* was 12.9, range 4 to 36; while the mean number of adults reared from 22 puparia of *N. maculosa* was 11.4, range 4 to 17. Other hymenopterous parasites reared from this tortricid were 64 specimens of *Itoplectis conquisitor* (Say), 25 individuals of *Triclistus curvator* (Fab.), 8 specimens of *Bassus agilis* (Cress.), and one example of *Cremastus epagoges* Cush. (mass rearing).

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ON THE CHEMICAL SENSES OF SPIDERS.

By C. E. Abbott, Chicago, Ill.

Several years ago I found that when a bit of cotton wet with beef extract was brought close to the palpi of *Miranda aurantia,* the spider seized the proffered bit and fed from it. This was not due to vision, for these spiders give no response to living insects unless these are tangled in the web. It therefore appeared probable that this reaction was olfactory.

In a recent issue of *Entomologica Americana,* Kaston has reported a thorough study of the senses of male spiders involved in mating responses. Although he admits the presence of a chemical sense in male spiders, Kaston believes that this depends chiefly upon contact, and that olfaction has little influence on the behavior of spiders. In his summary he states that, "There is no evidence that a sense of smell is used in sex recognition by any spiders."

Although it may appear that the results of the following experiments contradict the findings of Kaston, such is not the case for the following reasons: (1) with two exceptions, my specimens were not only a species not used by Kaston, but belonged to a family (Argiopidae) different from his; (2) they were all females, and (3) the test substance (beef extract) was in the nature of a food. Some students have used essential oils for such tests, to which Kaston properly objects, on the grounds that such substances are irritating.

In a preliminary test, six specimens of *Miranda aurantia,* starved for a period of 48 hrs., were tested by bringing a bit of cotton soaked in beef extract close to the palpi. Five of the specimens seized the cotton, but since it was not certain that the palpi had not been touched, the experiment was repeated in a more thorough manner.

Thirteen specimens were used. Immediately after capture eight of the specimens were lightly anaesthitized with ethyl acetate and the palpi removed as close as possible to their point of attachment. Five specimens were retained in a normal state for controls. After starving for 24 hrs., the spiders were offered first water and then beef extract. For this purpose new pipe-cleaners were used; the wetted end being brought within a distance of 2–5 mm. of the palpi, where the test substance was kept for 30 seconds. If the animal did not respond by the end of that time, it was considered negative to distance stimuli. The palpi were then touched lightly. If still no response occurred, the test substance was touched to the tarsi. The experiments were repeated at the end of 48 hrs.

Three of the amputated specimens died between the first and second tests. This may not have been due entirely to shock, for spiders deprived of food for any length of time succumb quickly. The specimens that remained alive reacted normally in other ways, in fact one of them began to build a cocoon.

The results of these tests are given in the table below:

Specimens	Response to water.	Response to beef extract.
	Starved 24 hrs.	
Five, normal.	Negative at a distance; positive when touched.	Positive at distance; one specimen only moved chelicerae.
Eight, amputated.	One responds as a distance of about 1 mm., others negative.	No response; one specimen moved chelicerae slightly.
	Starved 48 hrs.	
Five, normal.	One responded at a distance of 1 mm.; others only when touched.	Positive at a distance; three responded when the substance was 3–5 mm. away.
Five, amputated.	Three positive when touched; two entirely negative.	All negative.

These results require some explanation. All of the normal specimens invariably responded when the beef extract was brought within 2 mm. of the palpi; in some cases they responded at a greater distance. Usually the spider first extended the palpi to touch the substance, though in one or two cases this was seized without the preliminary contact. The specimens deprived of palpi not only did not respond at a distance, but often made no effort to feed even when the chelicerae were touched. Occasionally, bringing the extract near the legs resulted in feeble chewing movements. Even the amputated specimens sometimes gave a feeding reaction when touched with water, especially if this contact was with the tarsi. In the case of normal specimens touching the palpi with water also evoked the response. Only one specimen gave a distance response to water, and the latter was less than 1 mm. from the palpi. One specimen with only the two basal segments of one palpus intact gave no reaction to the extract, indicating that the chemical organs of the palpi are chiefly in the terminal segment.

Additional experiments were made on six specimens with the palpi covered with shellac. These gave a feeding reaction *only when the tarsi were touched.* According to Kaston the "slit sense organs" are pretty generally distributed, occurring on the legs as well as the palpi, so that to explain the results of my experiments one must assume either that the palpi possess additional organs of sense, or that the slit organs on them are more sensitive than those on other parts of the body.

That the responses to water are not due to the reduced temperature due to evaporation was demonstrated by bringing near normal spiders a glass rod cooled to freezing temperature (0° C.). The animals either fled from this or attempted to climb it; in no case was a typical feeding reaction given.

The experiments with beef extract were also tried on a female Attid and a female Lycosid (species not determined). The Attid gave a response similar to those of *Miranda,* but the Lycosid fled.

From the results of these experiments I have concluded that: (1) starved specimens of *Miranda aurantia* are very sensitive to water, which they perceive chiefly, if not entirely, by contact; (2) the palpi certainly, and the legs probably, are capable of detecting distance chemical stimuli, and (3) the palpi are also sensitive to chemical substances on contact.

In view of the fact that the palpi of insects are probably the physiological homologues of the pedipalpi of spiders, it is interesting to note that the latter appear to function as a kind of olfacto-gustatory organ.

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Kaston, B. J. 1935. The slit sense organs of spiders. Jour. Morphol., 58, pp. 189–206.

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METHODS AND TECHNIQUE.

A Dry Killing Bottle.

For the past ten years I have successfully used for killing insect specimens a cyanide jar which possesses advantage over most types of killing bottles in ordinary use. Inasmuch as its construction is simple and inexpensive I am offering the following description.

The killing agent used is Cyanogas Calcium Cyanide of which the G-fumigant brand with particles of the texture of sea sand is easiest to handle although any brand may be used.

A bottle or jar with a broad neck should be chosen. Into the bottom is placed a layer of Cyanogas. This is levelled by light shaking. A layer of cotton is then crowded down over the cyanide. Over this is pressed a circular piece of corrugated cardboard which had been previously cut to a size slightly larger than the inside diameter of the jar. After this cardboard has been placed evenly and firmly over the cotton it should be stuck to the walls of the jar. A liquid cement such as Duco household Cement, Le Page's Liquid Cement or other satisfactory type of acetate cement may be used, making a complete and even ring of cement over the border of the cardboard and the adjoining portions of the glass. Allow the cement to harden and the jar is ready for use.

Advantages as compared with other killing bottles:

1. Much cheaper than Potassium Cyanide.

2. Makes a dry bottle, which is important in the case of delicate Diptera and other insects. Does not deliquesce as does sodium cyanide.

3. It can be easily emptied and recharged, which is not true of a plaster of Paris bottle. To empty, simply pour in hot water; when this has softened the cardboard, the latter and the cotton may be easily removed. The cyanide dissolves in the water and may then be poured out. After washing and drying, the jar is ready to be recharged.

As is the case with most Cyanide bottles, it has one drawback; i.e., certain insects having a yellow or light green integument are likely to become discolored if allowed to remain in the killing jar too long. This is probably due to the ammonia which develops in an old bottle particularly. For this reason it is advisable to remove such insects from the killing jars as soon as possible after their death.—Stanley W. Bromley, Stamford, Conn.

BOOK NOTES.

Procedure in Taxonomy, Including a Reprint of the International Rules of Zoological Nomenclature with Summaries of the Opinions Rendered to the Present Date, by Edward T. Schenk and John H. McMasters. (Pp. i–vii, 1–72; Stanford University Press, Stanford University, Calif. $2.)

This is a work to stand beside Ferris's "Principles of Systematic Entomology" on the accessible shelf of every working entomologist who purposes to do descriptive work. In eight chapters, this little book discusses such topics as systematic categories, description of new species, specific names, synonymy, storage of type material, Latin terms and abbreviations; and in the Appendix it gives the International Rules and a summary of opinions rendered. It might seem almost needless to say that much rubbish is brought out from its hiding places and discarded.

While the examples cited are from palaeontology, they illustrate general principles of universal application, even in entomology. One of the valuable features of this work lies in the references to extensive discussions of the various principles set forth.

This note in no way attempts to be an extensive discussion of this work. To do so adequately and critically would produce an article nearly as long as the original. The extensive and minute Index—topical, name and subject—makes the work very fit for ready reference.

And we here repeat the recommendation that every descriptive entomologist secure a copy and master it. This will help greatly to clarify our entomological literature and make it the more readily usable. We have long needed to ask ourselves what we are aiming at and how best to get there.

Recommended Reading: We have received from two of our advertisers their most recent catalogues. One is "Turtox Biology Catalogue and Teachers' Manual," of the Biological Supply House; and the other Ward's catalogue of supplies titled "Entomology." Both of these will be found useful and helpful, the first being the more extensive. Both are full of information of interest to entomologists in general. If you have not received your copy, you should hasten to get it. While this note is written from the point of view of the interests of our guild, it seems it should end with the classic term (Adv.).

J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF FEBRUARY 13, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, February 13, 1936.

Mr. Rowland R. McElvare presided, and four other members present, namely, Dr. Roland F. Hussey, and Messrs. Dietz, Engelhardt and Siepmann; also, Miss Dietz and Messrs. Noah A. Bower, Peter Crowe, James T. Farrelly, Jr., Richard Fisco, Hans L. Stecher and Lester Weiss.

The minutes of the previous meeting were read and approved. The secretary also read a copy of the letter sent to Mr. Bather.

Mr. Engelhardt presented a treasurer's report, and read a short informal report from the editor, Mr. Torre-Bueno, which were ordered placed on file.

The paper for the evening, "Arizona Collecting Localities" by Mr. J. R. de la Torre-Bueno, was read by Mr. Engelhardt, who prefaced it with a few general remarks on Arizona, and an account of some of his own experiences in that state.

In area, Arizona is the sixth largest state in the union; it is two and one-half times the size of New York. Its population, on the other hand, is very sparse, about 2½ persons per square mile, compared with 380 per square mile in New York State. The maximum altitude in the state is San Francisci Peak, 12,600 feet above sea-level. The lowest point is the Colorado River at Yuma, 200 feet. Few mountain ranges exceed 10,000 feet in elevation, the average being 5,000 feet in Northern Arizona and 1,500 feet in southern Arizona.

Signs of tremendous volcanic action, and alternating upheavals and subsidences are evident in the physical features of the state. The predominating rocks, such as sandstone, limestone, shale, etc., are subject to rapid erosion by water and wind. The Grand Canyon, Painted Desert and the Petrified Forest are examples of this erosion. Crystalline rocks, such as granite, usually underlie sedimentary formations at considerable depth. The volcanic rocks, such as lava and basalt, are harder and resist the erosion, resulting in the flat topped mesa formations and serrated mountain contours.

The climate of Arizona is dry, with very low rainfall, hot summers and strong winds. Arizona has the reputation of having the largest number of clear days of any state in the union.

The history of collecting in this state dates far back; occasional insects were brought back by some of the early government expeditions. During the 1880's, Jacob Doll, Morrison and Neumoegen collected there.

The greater part of the evening was devoted to the reading of Mr. Torre-Bueno's paper, of which no résumé is given in the minutes as it will be published separately in the BULLETIN at a later date. About sixty collecting localities are described, and Mr. Engelhardt pointed out their location on a map as he went over the paper. Photographs and post card views of the region were shown.

Mr. Bower asked Mr. Engelhardt whether he had ever seen male Mutillas come to light, as he had never seen a record of their having been attracted to light. Mr. Engelhardt replied that he thought he had seen specimens at light.

The meeting adjourned at 9:50 P. M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF MARCH 12, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, March, 12, 1936 at 8:15 p. m.

President William T. Davis in the chair and eight other members present, namely, Dr. Joseph Bequaert and Messrs. Bower, Dietz, Engelhardt, McElvare, Rau, Sheridan and Siepmann, and Messers. Peter Crowe, Henry Dietrich, Richard Fisco, James T. Farrelly, Jr., Hans L. Stecher, and Miss Mary Carmvath, Mrs. Dietrich and Miss Dietz.

The minutes of the previous meeting were read and approved. The treasurer presented a brief report stating that all the society's bills for 1935 have been paid. Mr. Engelhardt read an informal report of the Publication Committee, sent in by Mr. Torre-Bueno, reporting that the glossary was in progress and again stressing the need of short entomological notes for the BULLETIN.

Mr. Engelhardt proposed for membership, Mr. Noah Bower, 121 Seaman Avenue, New York, New York.

Mr. Bower being present, it was moved that the by-laws be suspended, and that Mr. Bower be elected a member, which was accordingly done.

Mr. Engelhardt reported the death, on March 1st, of Andrew N. Caudell, for many years Custodian of the Collections of Orthoptera at the United States National Museum, Washington, D. C.

It was moved and unanimously voted that the following resolution be spread upon the minutes of the Society:

"Resolved: The Brooklyn Entomological Society records with deepest regret the death of Andrew N. Caudell, one of the foremost students of the Order Orthoptera, and distinguished for his achievements in a life-long service in the cause of entomology."

Dr. Bequaert, of the School of Tropical Medicine, Harvard University Medical School, said that owing to his absence from New York, he was attending a meeting of the Brooklyn Entomological Society for the first time in twelve years, and was pleased to see that the Society still kept up its traditions. Most entomological societies, he said, had a formal presentation of papers, but the Brooklyn Entomological Society differed from them in that papers were presented informally, specimens were always shown, and everybody joined in on the discussion. Other societies sometimes try to get away from the formal meeting, but they are only partially successful in doing so.

Dr. Bequaert said he was writing a paper on *Polistes* wasps and was interested in obtaining specimens of *Polistes* from Northern Mexico (Chihuahua, Sonora, etc.). The species of *Polistes* which occur in Arizona probably also occur in Northern Mexico as well, but there are no records. The species occurring in the vicinity of Mexico City are different. In regard to the question of whether male mutillas are attracted to light or not, Dr. Bequaert said that he had found that they were.

Mr. William T. Davis stated that the incorporation of the Brooklyn Entomological Society had been completed, and he showed the copy of the new charter dated February 10, 1936. A discussion followed as to what disposition should be made of the new charter, as no one knows what happened to the original charter of fifty years ago, and it is desired that a like fate will not befall the new one. The 1886 charter was published in the BULLETIN, and the 1936 Articles of Incorporation will be likewise published. Mr. McElvare volunteered to obtain a couple of photostatic copies of the charter, which will be retained by officers of the Society. A motion was made by Mr. McElvare that Mr. Davis be authorized to decide in what manner the charter shall be preserved, which motion was seconded and carried.

Dr. Bequaert said that all entomological societies pass through periods in which great interest is shown, followed by periods of stagnation. During these latter periods the minutes and other papers of the society frequently are lost or lost sight of. The method adopted by the Cambridge Entomological Club is to deposit the minutes, whenever a volume is completed, in the library of the Boston Society of Natural History. Dr. Bequaert suggested that the Brooklyn Entomological Society could adopt a similar procedure, depositing such items in a public institution where they would be preserved, and at the same time be available to interested parties who wished to see them.

Mr. Engelhardt proposed that the society give a vote of thanks to Mr. Davis for his trouble and expense incurred in connection with the incorporation of the society, and for his kindness, interest and benevolence shown thereby, which motion was seconded and carried.

Mr. Davis exhibited specimens of *Tibicen cultriformis* received from Mr. D. K. Duncan. This species occurs in Arizona, in the neighborhood of the White Mountains, and in part of New Mexico, over a very small area. This cicada has markings similar to the Hebrew letter *resh* on the mesonotum, and on the pronotum, a mark resembling a spiked helmet.

Mr. McElvare presented the paper of the evening on The Gaspé Peninsula. He made his trip there in September, 1935, and was very well pleased with it. He said that September and October are about the ideal time to make a trip through this region, as there is much fog in the spring, and there are tourists in July and August. The expenses are low, gasoline, however, being comparatively expensive, around 35 cents a gallon.

Inaccessible until about ten years ago except by trails and an occasional boat, a motor road built in 1928 opened up the country within easy access. This road, which goes around the outer rim of the peninsula, is for many miles wide enough for four cars, but later narrows to two-car width. The country is French, wild and unspoiled. Mountains rise up to 4450 feet, picturesque because precipitous, and in many cases, flat-topped. The quaint customs of the people also add to the attractiveness of the trip.

The chief occupation of the people during the summer is fishing for cod, for which the fishermen go from five to fifteen miles into the St. Lawrence. In the winter and spring, logging is engaged in, chiefly pulpwood. In the interior there is said to be considerable game, the peninsula being 170 miles long and 75 miles across, with no other road except the highway along the rim.

The Gaspé Peninsula starts about 200 miles northeast of Quebec, and one enters the real Gaspé country at St. Flavie, where the mountains become more rugged, and the road becomes a series of ups and downs. The rivers are short and sharp, opening up into wide estuaries, which are crossed by long bridges, covered in their main parts.

At Percé Mr. McElvare saw what he believed to be the most remarkable sight on the Atlantic Coast, the Pierced Rock. It is a sandstone rock, much eroded, 1500 feet long, 285 feet high and 300 feet wide at its widest part. It lies a short distance offshore, and its sides are almost perpendicular. The rock is divided into two parts by a sharp cut, and there is an arch at the outer edge which pierces the rock. A picture taken in 1845 shows that there were formerly two such arches.

Mr. Engelhardt showed some pictures he had taken thirty years ago on a trip to the Saguenay River, which is just across the St. Lawrence River from the Gaspé Peninsula.

Mr. Engelhardt showed two specimens, male and female, of the Satyrid butterfly, *Cissia mitchelli,* received from W. S. McAlpine, of Wilmington, Mich. Mr. McAlpine, who has collected this butterfly in numbers and has worked out its life history, desires more definite information about its occurrence in the east. The New Jersey List of Insects records it from Dover, N. J., collected by C. W. Johnson, and Holland's Butterfly Book states that it has been collected near Lake Hopatcong. Both these records are old, 30 or more years. It is possible that they refer to one and the same capture. The butterfly, as far as we know, has not been taken in New Jersey again, nor is it recorded in the list for New York State. A record by C. W. Johnson is hardly to be doubted, yet it is surprising that no additional specimens have been collected.

Mr. McAlpine writes: "This insect in Cass County, Mich., is found along very narrow grassy strips bordering small water courses in the middle of a dense tamarack swamp. This almost inaccessible habitat undoubtedly has considerable bearing on its scarcity in collections." More information regarding eastern records is wanted.

Mr. Engelhardt exhibited examples of all the species listed by Barnes & McDunnough under the genera *Cissia* and *Neonympha.* He also showed a pair each of *Samia columbia, Chrysophanus dorcas,* and *Calephilis borealis,* all species bred by Mr. McAlpine.

The meeting adjourned at 10.00 p. m.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF APRIL 16, 1936.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 16, 1936, at 8.15 p. m.

President William T. Davis in the chair and seven other members present, namely, Messrs. Dietz, Engelhardt, McElvare, Moennich, Sheridan, Siepmann, and Wilford, and Messrs. Henry Dietrich, L. L. Pechuman, Hans L. Stecher and Miss Dietz.

The minutes of the previous meeting were read and approved. Mr. Engelhardt, reporting briefly as Treasurer, said that the society was in good financial condition.

Mr. Davis showed photostatic copies of the Certificate of Incorporation which were obtained by Mr. McElvare. Mr. Sheridan made a motion that the Society extend a vote of thanks to Mr. McElvare for his services in getting the photostats, which motion was seconded and carried. Mr. Davis said that he was considering what provision should be made for the safe-keeping of the original Certificate of Incorporation, and thought the library of the New York Historical Society might be a good place for it. One of the photostatic copies will be filed in the minute book.

Mr. Davis exhibited specimens of galls of the gouty oak gall, *Andricus punctatus,* which were numerous on the scarlet oak, east of Whiting, N. J., and photographs of affected trees. He also exhibited a paper on the "Histopathology of Nerve Lesions of Cicada after Paralysis by the Killer Wasp," by Albert Hartzell, published in Contributions from the Boyce Thompson Institute, vol. 7, no. 4.

Mr. Wilford exhibited specimens of 46 of the 48 species of skippers (Hesperoidea) found in the vicinity of New York City, the two species not represented being *Atrytone logan* and *A. arogus.*

Mr. William T. Davis exhibited specimens of the larvae and adults of a 33-year-old colony of the Dermestid Beetle, *Thylodrias* (*Thelydrias*) *contractus,* Mots., which he reared from some specimens which were derived, through Joutel, from Mrs. Annie Trumbull Slosson's original specimens. This insect was first discovered in America by Mrs. Slosson in 1903 infesting some of her insect collections. The adults were so different from any other known American insect that entomologists did not know what they were, and hesitated about assigning them to any known family. The larvae are similar to those of other Dermestid Beetles, and were present in Mrs. Slosson's collection, but she had thought they were the larvae of one of the commoner *Dermestidae* that infest collections. This new discovery aroused considerable interest at the time, and for a whole year a picture of the beetle appeared on the cover of "Entomological News" as the most interesting insect of the year. Mrs. Slosson facetiously called the beetle "*Ignotus aenigmaticus*" in one of her articles in the *Canadian Entomologist,* which name was accepted as the scientific name until the identity of this beetle with *Thylodrias contractus* Mots., described from Asia 64 years previously, was established. In connection with his talk, Mr. Davis read the articles by Mrs. Slosson which appeared in the *Canadian Entomologist.*

The meeting adjourned at 9.50 p. m.

CARL GEO. SIEPMANN,
Secretary.

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